A FAWCETT PUBLICATION

JULY 25¢
IN CANADA 30¢

# MODERN MECHANICS AND INVENTI

## FLYING TANKS SHED WINGS

SEE PAGE 34

# Men who work with their hands make the BEST DRAFTSMEN

## Test Lesson Free to Prove it!

We are looking for more ambitious young fellows with factory, building construction, or other mechanical experience to prepare for well-paid positions in Drafting. Such men, we find, are unusually successful as Draftsmen, because they know how things are done, and that's a priceless asset to the man who makes the blue-print plans. Get in touch with us and we'll tell you how you can cash in on your entire past experience.

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You know enough about blueprints to understand that PLANS govern every move in factory and construction jobs. The Draftsman who makes them is several jumps ahead of the workman who follows them. And so we want you to know that DRAFTING is a logical, natural PROMOTION from mechanical and building work—better-paid, more interesting—just the kind of work you'd enjoy doing.

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Name.....

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City..... State.....

Age..... Occupation.....

# "...and I had no money"

"A MAN can knock along on what he's making until something happens! Then when the emergency comes and the money he *hasn't got* could do *so* much, the cold realities of life haunt him.

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* * *

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# MODERN MECHANICS AND INVENTIONS

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**Marden Mfg. Co.,**
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**Minneapolis, Minn.**

Rush full details about ROLL-O-MATIC—with free demonstration offer and facts on how I can earn big money easily.

Name.....

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**EDITED BY EXPERTS**

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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Don't spend your life slaving away in some dull, hopeless job! Don't be satisfied to work for a mere $30 or $35 a week. Let me show you how to get your start in Radio—the fastest-growing, biggest money-making game on earth.

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### Pay Your Tuition After Graduation

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H. C. Lewis, Pres. **RADIO DIVISION** Founded 1899

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**Radio Division, Coyne Electrical School**
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SOME men make more money playing than others do working. They started out with nothing but the ability to draw a little. You may have just as much ability. It costs nothing to find out—and it may be the most valuable discovery of your life.

The Federal Schools have taught hundreds of successful students. Many are now earning from $2,500 to $6,000 a year—others even more. Many famous artists contributed to this simple, thorough home course. In spare time you can learn the things they know about commercial art, color harmony, fashion drawing, lettering, poster designing, etc.

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## FEDERAL SCHOOL OF COMMERCIAL DESIGNING

7368 Federal Schools Bldg. Minneapolis, Minn.

Please send me Art Test and book, "Your Future."

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Age ..... Occupation .....

Address .....

# It Takes Nerve!

Read the glamorous story of Tom Mix—the man who spurns a double for the dangerous, death-defying stunts to be seen in all his pictures! You'll find many other stories about your movie favorites in this great magazine of the screen and a never-to-be-forgotten yarn—"Humans Stranger Than Fiction!"

Don't miss the stories about Fredric March, Jeanette MacDonald, Kay Francis, Dorothy Jordan, Wallace Ford and many others. A host of other smashing stories about the cinema, reliable screen reviews, beautiful portraits of stars and intimate, authentic news of players and studio events. Be sure to obtain your copy!

**JULY**

**Screen Play**

**ON SALE JUNE 3rd**

Look for This Cover

*If your news dealer is sold out, send 10c, in stamps or coin, to SCREEN PLAY Magazine, 529 South Seventh St., Minneapolis, Minn., and a copy of the July issue will be rushed to you at once.*

# "Enter the Radio Business? ...YOU'RE FOOLISH!" they Shouted

## —yet in a few months I was earning more than any of them

You should have seen their faces when I told them that in just a few short months I jumped from $35 to $75 a week.

"No more scrimping and saving pennies for me!" I said. "I've got a new car, and before long I'll have a home of my own. No more slaving for a boss, either. I'm my own boss since I went into Radio—and the work's like play."

Just a short time ago they had laughed at my decision to enter the Radio business. "You're foolish! You'll lose your shirt," they roared. "You're no mechanic, you don't even know the difference between a grid and a primary coil."

And now it was my turn to laugh. They were astounded that I made such a success in so short a time. They fired questions at me from all sides. How did I do it? Where did I learn? What school did I go to?

"I didn't go to any school at all," I told them. "I learned right in my own home—in my spare time—the quick, easy National Radio Institute way. It was actually fun learning. Everything was right before me—working outfits of parts, and instructions with pictures that showed me exactly how to do everything. I could hardly help learning. And best of all, almost from the very first lesson I was able to earn money in my spare-time fixing sets in my neighborhood. Before I had been studying three months I more than paid for the price of the course. I'll say that Radio is the biggest paying business I ever found!"

This story is typical of hundreds of National Radio Institute students all over the country. Young men with ambition and foresight everywhere are getting into Radio now. J. A. Vaughn, 3107 S. Grand Blvd., St. Louis, Mo., saw his earnings jump from $35 to $100 a week. John F. Kirk, Union Block, Spencer, Iowa, says, "My gross receipts for two and one-half months' business were $7,396.25."

The amazing growth of Radio has opened hundreds of new jobs for trained men. Radio manufacturers employ testers, engineers, service men, and buyers for jobs paying up to $7,500 a year. Broadcasting Stations use engineers, operators, station managers and pay up to $5,000 a year. Hundreds of operators enjoy world-wide travel and adventure in the employ of shipping companies with all expenses paid and a good salary besides. Talking Movies pay as much as $75 to $200 a week to men with Radio training. Radio dealers employ trained men to buy, sell, install, and service sets, and pay well for good men.

Opportunities for ambitious men in Radio are almost unlimited. An amazing 64-page book called "Rich Rewards in Radio" tells all about the many opportunities you can find in Radio—and this book will be sent to you *absolutely free!* It will also tell you about the famous National Radio Institute plan that has helped others to earn $50, $60, $75 a week and more; also all about the remarkable lifetime employment service.

The National Radio Institute course is *thorough*. You learn by actual practice with working outfits, not just by theory alone. First, you are told how to do it, then you see how by photographs, and then you do it yourself. Even the most modern and complicated sets hold no secrets from you. Yet this amazing course is simple, easy to master.

No need to give up your present job. Keep it until you prove to yourself that Radio will raise your pay. For the National Radio Institute course is guaranteed—if when you complete it you aren't fully satisfied with the lessons and instruction service, every cent you paid will be instantly returned.

Send the coupon below at once for the book, "Rich Rewards in Radio." It will be sent to you absolutely *free!* Learn how many have more than doubled their pay—see for yourself the wonderful opportunities for you in Radio. No obligation. Mail the coupon right now.

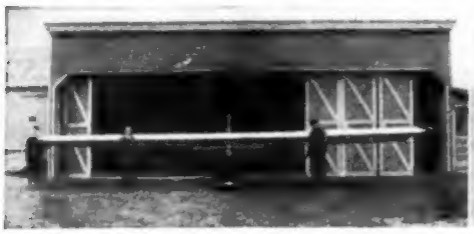
**National Radio Institute, Dept. 2GH, Washington, D. C.**

Gentlemen: Send me your book. I want to see what Radio offers. I understand this request does not obligate me.

Name .....

Address .....

City ..... State.....



No, the shot above is not the MM hangar. It is the wing shed of a group of Oneida, N. Y., birds. W. F. Miller, who built the glider shown, sent us the shot. Right—Here is the Cloudbuster, Jr., by W. B. Bidwell, of Portland, Ore. This is a one place, semi cabin high wing monoplane which Russ Haner says is easy to fly and which won't spin.

# Andy's Shop Mail Box

**The Double M Grease Monk takes time out to say "I tolja so" as he recalls his amazing ability in predicting events of the aviation and publishing world. Barge into this mechanical almanac. See whether you agree with Andy's owly observations.**

THE gook what wrote that blurb up above ought to be shot in the never-you-mind with a load of rock salt.

It just so happens I've no "amazing ability" and it just so happens that I happened to read proof on this barrel of pied tripe before it went to sleep on the press. So I rips me off my old "lead" to thank the donor of them there above honors and to tell him an' the world that when I discover him I'll send him around the corner of the hangar so fast he'll scoop sand in his hip pockets.

I claim that'll be leaning some.

* * *

Now, as a matter of fact, I have pulled a few lilies out of the graveyard and called the turns on quite a few things. And I fail to see why it isn't blamed interesting to look back and recall some of the dope just by way of proving that when old Andy jerks a hunk of grass out of the sod and does some cogitatin' there's apt to be a feeling in the wind that's pretty accurate.

For instance, you'll remember a few months back I told you spring was coming?

Carl G. Williams of Lawrence, Kansas, built this little ice sled using a Maytag washing machine engine for power.

Well it got here. It always has. I was right, wasn't I?

Then last month I rolled out of the cot at the hangar here before the birds quit warbling about what they were going to do to worms that day, and I says to youse guys, says I, "Don't you know," I sez, "that pretty soon the air will be full of airplanes," I sez, "and that a lot of them will be creditable home built buggies?"

That came to pass, as the man who wrote the Bible would say.

Letters roar in here by the sackful with pix of all sorts of sweet looking little ships, proving that the big noise about Disruption has been drowned out in certain quarters, at least. You can't kill an airnut. Not by talking him to death with stories about the Boogie Man.

Was I right or was I right? You should see old Andy's mail.

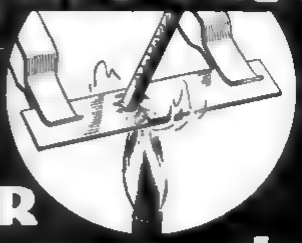
And another thing, I sez to youse guys I sez you'll be seein' more floating marine contraptions this year than ever before, I sez. Remember how I told about one of the joys of running a big magazine was the manner in which we run plans for things and then have them turn up six months to two years later in letters with pictures from happy gents who have had fun building these things? Well listen:

If you like statistics, here's what's been happening in the boat building fraternity as near as we've been able to check with correspondence which has reached this old Dope Doctor.

We know that 171 Pietenpol Air Campers are building or have been built. Mail and blueprint sales check each other. Fifty men are building John G. Hanna's design of Dorothy. Construction has been started on 124 cruisers of the Gannet type, designed by Chas. Hall, a member of our editorial staff. Westy Farmer's designs have had phenomenal popularity. A couple of years ago in collaboration with Philip L. Rhodes, widely known New York ship designer, he designed Allegra, an outboard cruiser. We had no way of checking the matter in those days, but photos of four

*(Continued on page 12)*

# TEN SECOND WELDING TEST amazes thousands!



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Alumaweld welds aluminum in ten seconds—without an acetylene torch. Alumaweld solders cast iron—with a strength ten times that of ordinary solder. Alumaweld repairs pot metal and pewter—quickly, easily and lastingly. Is it any wonder that this solder has become the talk of the country?

## USE ALUMAWELD—for any metal repair!

Alumaweld saves money on all metal repairs. Thousands of people in all sections of the country are using Alumaweld for crank cases, burst water jackets, scored cylinders and cracked heads on automobiles and tractors; vacuum cleaners, washing machines, pots and pans, and radio sets in the home; farm implements; engines, crank cases, and metal work on aeroplanes; outboard motors and gas tanks on boats; steam radiators, steam pipes and water pipes in hotels, clubs, institutions and public utilities; general machine work, sheet metal work—and wherever metal is used.

## Easy to apply—absolutely permanent

Alumaweld is applied with an ordinary soldering iron or blow torch. It can be used by anyone—without experience. It has a tensile strength of 12,000 lbs. to the square inch, and will withstand cold water pressure up to 1000 lbs. and steam pressure up to 500 lbs. at live steam temperature. There is no electrolysis between Alumaweld and any metal to which it is applied, so a repair is POSITIVELY PERMANENT.

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Alumaweld is so revolutionary—so amazing—it sells itself. We invite you to make the welding test—a test that has astounded the largest concerns in this country. Here is what you do. First, send for a kit of Alumaweld, using the coupon below. With this kit, we will send you two strips of sheet aluminum. Lap these together as shown in the above drawing, apply flux and solder and hold over a flame. If they do not weld in ten seconds—or if you can break them apart after welding—we will return the full purchase price of Alumaweld. Could anything be fairer? Could any test be more severe and better prove the merits of this product? Send for a kit today. The cost is one dollar, for seven good sized sticks of solder, a bottle of special Alumaweld flux, a tempered steel cleaning brush, two strips of sheet aluminum for the welding test, and complete easily followed directions. Use the coupon—now!

**ALUMAWELD COMPANY, Dept. 1-C,**
**710 E. Broadway, Glendale, Calif.**

Gentlemen: Mail me immediately a complete kit of Alumaweld, containing seven good-sized sticks of solder, a bottle of flux a tempered steel cleaning brush, two aluminum strips for test purposes, and complete, easily followed directions, for which I am enclosing one dollar. If, for any reason, I am not satisfied, you agree to refund my money—without question.

☐ Check here if you want agent's proposition.

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# THE SECRET OF success IS SPARE-TIME STUDY

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Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

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| Structural Draftsman | Steam Electric Engineer |
| Structural Engineer | Civil Engineer |
| Electric Wiring | Surveying and Mapping |
| Electrical Engineer | Refrigeration |
| Electric Lighting | R R Locomotives |
| Welding, Electric and Gas | R R Section Foreman |
| Reading Shop Blueprints | R R Bridge and Building Foreman |
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| Mechanical Engineer | Chemistry ☐ Pharmacy |
| Mechanical Draftsman | Coal Mining Engineer |
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City ..... State .....

Occupation .....

*If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada*


# ANDY'S SHOP MAIL BOX

*(Continued from page 10)*

Allegras have shown up. One in the South Seas, one on Lake Superior, one in Florida and now comes the latest from up in Maine. Perfectly executed, and right to the dot as designed, which is the only sensible way to build a well engineered design.

Farmer's Miss Modern Mechanics hydroplane has also been widely built. More lately a check among readers we are in contact with reveals his Punkin' Seed has been laid down to the tune of 158 hulls at this time, and many pix have been run of this boat.

We could go on like this for each of the many titles published over the past few years. And the actual figures are available if you want 'em.

And that's that.

**By way of an interlude, pause here for a moment and glimpse this Arkansas river ferry. It is M-M reader S. Argabrite's version of a Ford "wind boat."**

Now for some predictions: I figger that Sam Wing and his Mechanical Package Magazine experimental station acrost the field are scoring heavily in the matter of reader interest in mechanical doings. Watch other mech mags run stuff of miniature engines and automotive wheel goods. Sam told me that he took the lead with the Mighty Atom plans—a little 3-8 h. p. marine engine which he showed how to build in Vol. 1, No. 1, of his worthy sheet. And he has been told that other eds are going to plan to run more motor and lathe and building stuff as a result of the fresh slant the Pack Mag has taken.

That's the way it goes around here. I don't claim that M. M. or the Pack Mag are the best mags on the market from every standpoint, but it's as plain as the nose on a pig's face that the editors of these two books are miles ahead in courage and daring in carving out new ideas, new things to run, new plans to publish.

Then like the Russian or the Japs, someone takes the same idea and tries to cop the credit just by shining the shoe of the idea up with a higher polish. Do a little looking around and observing and see if what Andy Monk says ain't so.

* * *

And watch other mags for more boat stuff and for miniature engine dope. Remember Andy toljaso.

* * *

All this and yet no letters from the gang. I've

*(Continued on page 14)*

# PARKS AIR COLLEGE CELEBRATES OVER 4,000,000 MILES OF SUCCESSFUL STUDENT-FLYING AT ITS OWN AIRPORT!

FOUR million miles is a great deal of flying. Such a figure might represent the yearly record of a great air-transport system. It takes on a special meaning when you realize that it has all been flown from one airport, during the past four years, in the daily routine of student-instruction.

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(Print name and address plainly)


# ANDY'S SHOP MAIL BOX

*(Continued from page 12)*

been selfish. One right after the other here they come:

Says Russ Haner, who sends us the picture of the Cloudbuster, Jr., which graces the head of this column this month along with Miller's New York glider:

Dear Andy:

Just a line to tell you the latest flyin' news from the wild west. (Where men are men, etc.)

I want to announce the Oregon Light Plane Association. We now have about thirty-five members and are still growing. This is an organization of light plane fans who have gotten together for the purpose of exchange of ideas and to co-operate with the State Board of Aeronautics and the D. of C. inspector.

I'm sending a snapshot of the Cloudbuster, Jr., a light plane designed and built by Mr. W. B. Bidwell, president of the club. This ship has been flown about 150 hours and has developed no "bugs."

Also under construction are two Heaths, a Georgias Special, a Pietenpol Camper and another ship of original design but very similar to the Cloudbuster.

Two of the members are building motors and another is a propeller expert.

The Cloudbuster is a one-place, semi-cabin, high-wing monoplane. Is very easy to fly and will not spin. Data follows:

| | | | |
|---|---|---|---|
| Span | 37' | Cruise | 70 mph |
| Chord | 60" | Landing Speed | 15 mph |
| Length | 23' | | |
| Wt. Empty | 375 lb. | Power 50 hp | |
| Wt. Gross | 600 lb. | Salmson motor | |
| High Speed 80 mph | | | |

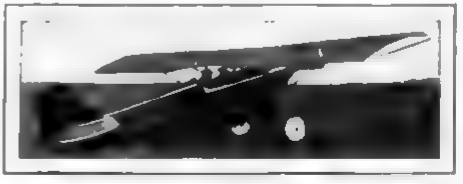
Any Oregon light plane fans wishing more information about the club may write the secretary, Mr. A. B. Crosier, 1057 E. Washington St., Portland, Ore., or the writer of this letter.

We all like M. M., Andy, and your column best.

Happy landings,
RUSS HANER,
55 East 62nd Street,
Portland, Oregon.

Thanks, Russ. A blush and a bow from me uns and to you uns.

Probably no subject in the country which has



Lou Stemmer sends us this shot of his home built Air Camper without comment save, "She flies fine!"

*(Continued on page 16)*

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# ANDY'S SHOP MAIL BOX

*(Continued from page 14)*

been so generally misunderstood as this matter of flying unlicensed light planes. A lot of well meaning but thick headed bone domes, armed with disconcerting half-truths, have slid in and out of numerous hangars spreading gloom about "not being able to fly an unlicensed ship in this state." Or that state

Northrop glider, home built from M-M plans obtainable in the 1930 Flying Manual. This job was built in New York by Carl Bonney and Jack James, seen with the ship.

All who have written me have been reminded that all state laws are supplementary to Federal laws, and that the guiding spirit behind the Federal regulations is the Department of Commerce.

This worthy body has never said anything about not allowing unlicensed ships to fly. What they have done, and you can see that they have had to make a three way liaison to the combination, is to make it mandatory for licensed ships to be flown by licensed pilots from licensed fields.

**WHAT LICENSING REALLY IS**

All that the matter of license implies is that the safety of the citizens is not unduly jeopardized by a lot of wild would-be airnuts (you know the kind) who would be willing to risk their own necks and anyone else's neck merely because they were too slipshod to think, too lazy to check their goods.

The same thing holds in numerous other combinations for both the pilot and the field licensing sides, as you can readily see.

But the Department of Commerce has never, nor has any State to my knowledge to this day, allowed anything to stand in the way of a man building his own ship, or in the way of getting his identification number and flying that ship, providing:

1. That he did not fly from a licensed field. (Doing so would disrupt the legal and psychological aspects of the thought that the licensing machinery had been set up to foster; namely, public confidence.)
2. That he did not carry passengers or freight for hire, no matter where he was flying, or what.

*(Continued on page 20)*

# Railway Postal Clerks

## $158 Month First Year
## Raise to Maximum of $225 Month

*Many Other U. S. Government Jobs Open to Men and Boys 18 to 50*

**POST OFFICE CLERKS  RURAL MAIL CARRIERS  CITY MAIL CARRIERS**
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### ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year regularly, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year. $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

### PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country.

### CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get $1700 the first year regularly and automatically increase $100 a year to $2100 with further special increase to $2300. They also have 15 days' vacation. City residence is unnecessary.

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| | |
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| —City Mail Carrier | ($1700-$2100) |
| —Rural Mail Carrier | ($2100-$3400) |
| —General Clerk and File Clerk | ($1260-$2500) |
| —Inspector of Customs | ($2100-$3300) |
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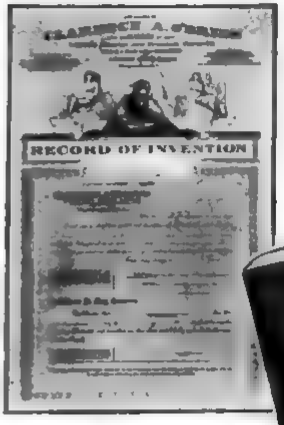


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**CLARENCE A. O'BRIEN**

***Registered Patent Attorney***

**WASHINGTON D. C.**

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# TENTS

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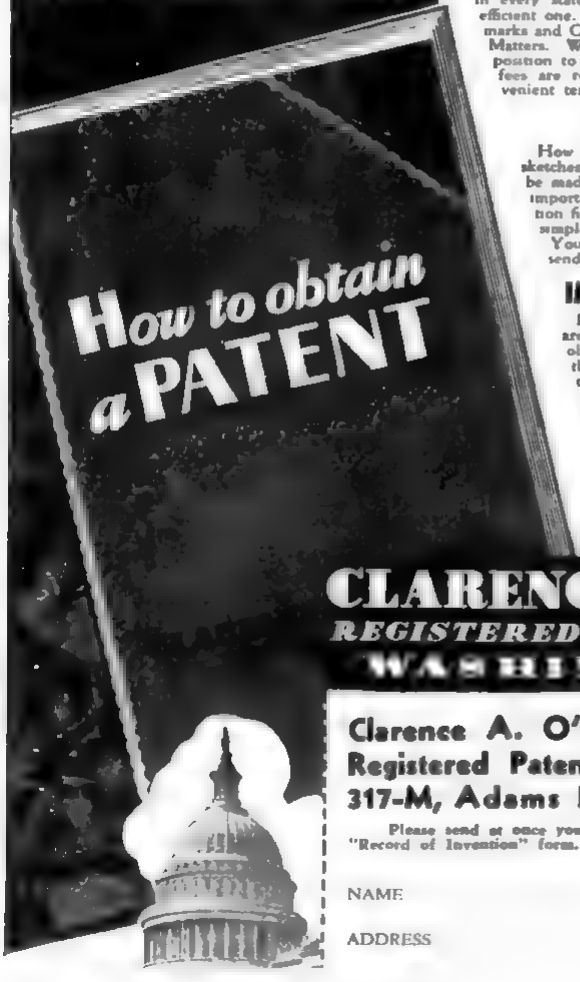


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# ANDY'S SHOP MAIL BOX

*(Continued from page 16)*

(Payment of money for transportation brings the transaction under the jurisdiction of the Department of Commerce again.)

3. That he carry an identification number.

**Creditable home built planes like the Halfpint, built by MM reader Ronald Meer need only identification on numbers —no license—but must not be flown from accredited fields.**

Flying is a business, and a big one. It must be protected with laws which insure its prog-

It has been only the best part of sense to organize the industry, therefore, on a basis which would assure the buying flying public that the ships it was using were safe from an engineering standpoint (stress analysis), that the pilots who were flying them were competent (hence pilots licensed on basis of experience, private, l.c. and transport) and to make sure of this dual combination a third element had to be introduced which would guarantee that the ship flown was approved by the government and that the man flying it was approved for his job on the basis of proved (not 'hot air') experience. So the government had to see that fields were licensed if they were carrying passengers or freight for hire. Certain other restrictions had to be observed in the matter of interstate commerce, but they are not important here and have no bearing on the case.

This three way tie-up was necessary to make any part of the scheme function.

A ship could be grounded, and still be flown by an unlicensed pilot, the field operating the line disclaiming any liability if it were not made plain that the pilot and field had to be licensed too.

Thus any shyster field could not be penalized unless it too were licensed, and suffered the penalty of possible revocation for pulling monkey business.

Some to whom I have written have not seemed to savvy. The whole thing is summed up as well as I can do it in this letter from Wilson Miller, Oneida, New York.

**Dear Andy:**

**I received the check that was sent me for previous photos several months ago and wish to thank you for the remuneration.**

**Enclosed are two pictures of a new primary glider that I have just competed, test flown and it flies excellently.**

*(Continued on page 24)*

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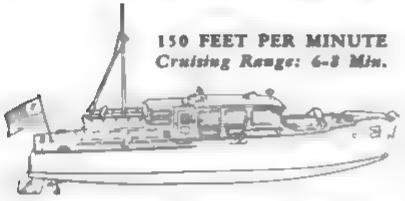

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# ANDY'S SHOP MAIL BOX

*(Continued from page 20)*

The hangar in the photo is my place of operation and I am seated in the glider with several pals standing along the side. The picture of the glider in the air is the water glider and is the only shot out of a roll that was any good.

I have not been able as yet to get photos of the little ship for one reason or another and for the last several weeks it has been too muddy to venture out.

I have some very good information for the amateur builders in the State of New York which is absolutely authentic.

I have read with much interest the letters on how the builders in this state have been prohibited from making light planes of their own and have heard and have been personally told and asked by fliers and others how, why and what was I going to do about building and flying planes in face of the new law which stops all such doings. Well, all the gentlemen and others with this would-be "good news" have been misinformed or else do not know what they are talking about when they say that you can not make and fly your ship in New York State.

Well, here's all the dope. Several months ago or to be more correct it was late last fall I believe I had a talk with the late Lt. Hughes who was in charge of the New York State Police aeronautical branch. Lt. Hughes met his untimely death when he was returning from a mission and crashed a tree in a mountainous, fog-covered section. The lieutenant was very well known and greatly liked by all and had scores of friends and I had the good fortune of being one of them. Lt. Hughes told me that he wanted to fly my ship several times and I assured him that I would be only to glad to give him the opportunity but now that can never be.

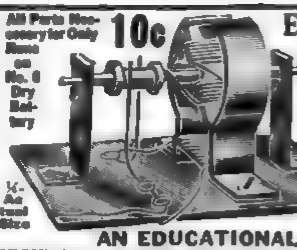
Well, here's what he told me after asking many questions. Lt. Hughes said that it was not the intent of the law in any shape or manner in prohibiting the amateur builder or experimenter in making and flying his own plane but rather encourage it. All that is required is an identification mark on the plane and that it must be navigated under the same restrictions placed upon an identified ship by the national law. Plus this one restriction, which is placed by the New York State law which does not permit an identified or experimentally licensed plane of this class to fly more than ten miles in radius from its operating base. One who builds his own plane from purchased plans, designs his own or buys it knocked down is considered the manufacturer and is governed by this restriction or law substance here stated.

Sincerely yours,
WILSON F. MILLER.

As far as I know, the only State which has passed a universal grounding law (and I doubt the validity and 'teeth' of this one, too, not having been able to get anything definite about it

*(Continued on page 26)*

All Parts Necessary for Only 10c as per No. 6 Outfit No. 7



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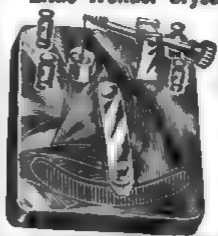

Say what you will about Electrical and Battery Sets, a CRYSTAL set has them all beat for simplicity and clearness of tone. There is absolutely no noise and no distortion—no batteries to buy—no tubes to wear out—no maintenance or upkeep whatsoever. Cost nothing to operate and will last indefinitely. Reception is loud and clear. This Receiver is guaranteed to work equal to the most expensive Crystal Set you can buy. Has a receiving radius of over 25 miles, or under favorable conditions up to 100 miles. Constructed of the finest materials throughout, including unbreakable crystal detector and quick reacting Pri. & Sec. Receiver only **$1.00 postpaid.** Or complete with Ear Phone and Aerial Wire—everything all complete—nothing more to buy. **$2.95 postpaid.**

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The HOW and WHY of electricity fully told in simple language that any boy can understand. Scores of plans and instructions for making—dry batteries, dynamos, electric motors, telegraph apparatus, telephones, electric lights, electric door bells, alarms, electric engine, rheostat, mail box alarm, electro-magnets, automatic incandescent [illegible] electric shocking machine, wireless telegraph apparatus, induction coil arc light, current reverser etc., etc. Tells all about electric wiring, static electricity, magnets and magnetism conductors and insulators, electrostatic induction, electrophorus, electroscope, condensers, Leyden jar dynamic electricity, the voltaic cell electromagnets, electrolysis, electro-plating, electrotyping, how to build a radio for a few cents, etc., etc. 192 pages, 100 Illustrations. **10c. postpaid. JOHNSON SMITH & CO., Dept. 901 RACINE, WIS.**

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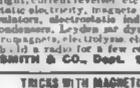

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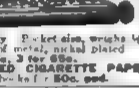

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O Effective Speaking
O Telegraphy

Name .....

Present Position .....

[illegible]


# ANDY'S SHOP MAIL BOX

*(Continued from page 24)*

from various state officials) is the illustrious state of California. What agitation about it that reaches this office generally simmers down to the offended dignity of some builder who has been told by some poorly-informed Inspector that he cannot fly the ship (generally meaning from a licensed field).

Well this holds good in any state. But there is nothing in the books about prohibiting you or me from building a sail around a couple of Carnation Milk cans, and if we can get it to fly, from flying it to our hearts content from a cow pasture of our own choosing.

And that's that.

Generosity personified is Carl R. Williams, who sent us some shots of his little ship for ice scooting. The shots weren't so hot, so we asked for more.

Dear Andy:

**I have at hand your letter. I am very sorry that it will be impossible for me to take other photos of the sled, however, I am enclosing another view which I took about the same place that the other was taken.**

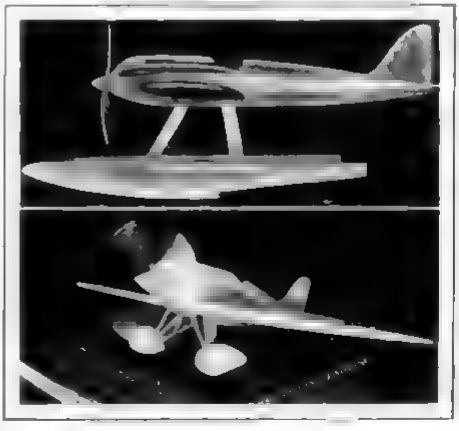
**If the photographs are not suitable you need not return them.**

Very truly,
CARL R. WILLIAMS, JR.

Seems to be no end of interest to these little motor sleds. Just because Williams' sled was cute I ran the pix on the opening page to show you how good she looks.

And an interesting letter comes from Steve Mackinaw, of Pittsburgh, Pa., who has had an interesting life although he is still under the 25 mark. Recently matriculated at Kelly, and then his eyes went bad. Tough break. Below is a sample of one of his hobbies.

A surprising thing is the number of shops owned by most readers of M - M. Seems as though everybody has at least a jackknife, and they range



Steve Mackinaw of Pittsburgh, sends us these shots of some of his whittlin'. Right perky looking jobs.

*(Continued on page 28)*

# Fore!

## LESSONS BY EXPERTS *only* 15c

If you are having trouble with hooks and slices, chip shots and putting—

If you are off your game—

If you're tired of being a duffer and want to play a regular game—

This book gives you championship instruction on Driving, Iron Shots, Mashies, Niblick, Putting and Fault Correction by such noted players as Bobby Jones, Gene Sarazen, Tommy Armour, Chick Evans, Harry Cooper, Walter Hagen, Horton Smith, Johnny Farrell, Bobby Cruickshank and Francis Ouimet.

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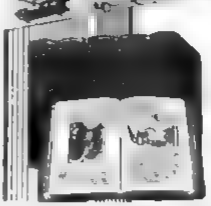

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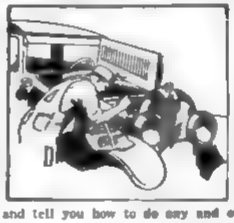

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The coupon must be filled out in full. If not employed write us a letter explaining your work.

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BY A. L. Cummin

***Who in 4 Months, Without Experience, Became a Hotel Manager, with a 90% Increase in Salary.***

"I WAS idly looking over the pages of a magazine. Tired after a hard day at the garage in which I worked, dissatisfied with my salary, the lack of opportunity, long hours and unpleasant surroundings, my attention was drawn to an advertisement, 'Hotels Call For Hundreds of Trained Men and Women.' I clipped the coupon and sent for a copy of the Free Book offered.

"Soon the Lewis Schools' book, 'YOUR BIG OPPORTUNITY,' arrived. Here was an industry that offered everything I wanted. Fascinating work amidst rich, luxurious surroundings, daily contact with the best people, more pay and unlimited opportunities. What a contrast to my garage work! I enrolled that evening.

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Please send me FREE of charge and without obligation details as to how to qualify for the hotel club restaurant and institutional field by spare time study. I am particularly interested in the positions I have checked above.

Name .....
Address .....
City State

# ANDY'S SHOP MAIL BOX

*(Continued from page 26)*

all the way from a sack of screws and a wrench all the way up to Rod La Rocque's recently described home workshop that lacks only a foundry for making a second Ford River Rouge plant. And with this thought in comes Sam Dunnuck:

* * *

South Bend, Indiana

**Dear Sir:**

**I have been a reader of the MM for quite a while and find it very satisfying. However, I am a midget auto fan and I have been waiting patiently (?) for more than a year for some good practical plans for a small run-a-bout. My ideal is something like the job described in the article introducing your Midget Car Contest. If you have the plans for that bus please inform me.**

**I have been thinking for some time about an auto having not more than a two cylinder motorcycle engine and developing not more than forty M. P. H. In my opinion it should have snappy lines (not confined to conventional design) and its construction should not be too intricate nor should it involve too much lathe (etc.) work as I have but a limited access to a machine shop. I believe the wheel-base should be about 60 to 70 inches. The cost ought to be from $35 to $50 or thereabouts. No doubt I am expecting too much but if you have anything like that let me know. I am sure that there are plenty more in my boat and I think a how-to-build article on that would prove popular. By the way, congratth to Ted Murkland. He expretheth me juth right.**

**Do you know the cost of those "air-wheels" (those overgrown rubber doughnuts)? If any of the gang know where I can get a small set of them or a low priced twin cylinder motorcycle engine complete with a transmission around South Bend or vicinity I would be much obliged to hear from them. My address is:**

**SAM DUNNUCK,**
**315 No. Shore Drive.**

I dunno, Mr. Dunnuck. Goodyear of Akron will furnish baby tires. They make them down as small as 14x3. And don't think small auto stuff isn't hot and wanted. I'm like the Deacon in the Lindbergh case. I can't say anything but "Watch the paper." If I commit myself I may get shot.

* * *

A lot of fellows are restricted from tackling full size projects merely because they do not have housing facilities for caring for bigger stuff. Of a necessity they turn to model making, which is one of my own pet diversions. There is an appeal about the thoroughness with which all types of engineering problems can be gone into that immediately challenges the imagination of the thinking man once he becomes engrossed in the possibilities of models. One of our readers, Jarvis M. White, of Westlawn, N. J., shows on page 30 an action shot of one of his efforts. There's as big a thrill in model making as any sport I know.

*(Continued on page 30)*

# Just 7 Days

## ....that's all I need to PROVE I can make You a NEW MAN!

by Charles Atlas

**Holder of the title:**
**"The World's Most Perfectly Developed Man"**

**NOTE:** *No other Physical Instructor in the World has ever DARED make such an offer!*

ONE week! That's all the time I need. In 7 days I'll PROVE that I can make you over into a *new man of vitality* and *power*.

I'll do for you exactly what I did for myself. I was once a 97-pound weakling. I was sickly, only half alive. I had a flabby, namby-pamby body

How I changed myself from this "below average" physique into the man who won —against all comers—the title of "World's Most Perfectly Developed Man" is an absorbing story. It is told in my book, "Everlasting Health and Strength," which I will send you *absolutely free* if you fill in and mail the coupon below.

### It's Easy MY WAY

Big *claims* mean nothing! That is why I offer you more than *promises*. That is why I offer you a 7 days' trial of my famous method, *Dynamic-Tension*. That lets you see for yourself that I back up every promise I make. That PROVES beyond a flicker of a doubt that I *can* and *will* turn you, too, into a vital, powerful NEW MAN.

Thousands of fellows all over the world have used my method—and now you can too. Like them, you can put on firm layers of muscle where you need them most, tone up your whole system, banish constipation, poor digestion, bad breath, pimples and other ailments that rob you of the good things and good times of life, and get the "drive" that'll take you to the top of the ladder.

### I've Got NO USE for Apparatus

I haven't any use for tricky apparatus and machines that may strain your heart and other vital organs. There's nothing unnatural or artificial about this method of mine. And I don't dose you or doctor you. *Dynamic-Tension* is all I need. It's the natural, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of ailments and surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

**FREE BOOK**

Gamble a 2c stamp today. Mail coupon for free copy of my new book, "Everlasting Health and Strength." It shows you from actual photos how I have developed my pupils to my own perfectly balanced proportions. Where shall I send your copy? Jot your name and address down on the coupon. Mail it today to me personally.

CHARLES ATLAS, Dept. 6W,
133 East 23rd Street, New York City.

I want proof that *Dynamic-Tension* will make a New Man of me—give me a healthy, husky body and big muscle development. Send free book, "Everlasting Health and Strength."

NAME.....
(Please print or write plainly)

ADDRESS.....

CITY ..... STATE .....

© 1932 C. A. Ltd.

### Send for YOUR Copy of My FREE BOOK

Don't be held back by a below par body! Now you can easily and quickly make this new man of yourself! Do what my thousands of other pupils did—send for a free copy of my illustrated book, "Everlasting Health and Strength." Learn how I built myself up from a weak, no-muscle, always-tired "runt" to winner of the title, "The World's Most Perfectly Developed Man." Gamble 2c to mail my coupon—to learn how YOU can win the biggest prize in life—a handsome, healthy, husky body. Address CHARLES ATLAS, Dept. 6W, 133 E. 23rd St., New York City.

# Amazingly Easy Way to Get Into ELECTRICITY

## PAY YOUR TUITION AFTER GRADUATION

Don't spend your life waiting for $5 raises in a dull, hopeless job. Now . . . and forever . . say good-bye to $5 and $6 dollars a week. Let me teach you how to prepare for positions that lead to salaries of $50, $60 and up a week in electricity — NOT by correspondence, but by an amazing way to teach right here in the great Coyne Shops that makes you a practical electrician in 90 days! Getting into electricity is easier than you imagine for right now I am making an offer no other school ever dared to make. PAY FOR YOUR TUITION IN EASY PAYMENTS AFTER YOU GRADUATE.

## LEARN BY DOING — IN 90 DAYS

### BY ACTUAL WORK—In the Great Coyne Shops

I don't care if you don't know an armature from an air brake—I don't expect you to! It makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have. That's why I have worked out my astonishing offers. Mail coupon for... all the facts.

## EARN WHILE LEARNING

If you need part-time work to help pay your living expenses I'll help you get it and when you graduate I'll give you lifetime employment service. And, in 12 brief weeks, in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . on one of the greatest outlays of electrical apparatus ever assembled . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . everything from door bells to farm power and lighting . . full sized . . in full operation

## ELECTRICAL REFRIGERATION

Right now I am including my big new Electrical Refrigeration Course. I train you on real electrical machinery . . building real batteries . . . winding real armatures, operating real motors, dynamos and generators, wiring houses, etc

**GET THE FACTS** Coyne is your one great chance to get into electricity. Every obstacle is removed for you don't have to pay for your tuition until after you graduate then you have ten months to pay it in small payments starting 2 months after you graduate. This school is 33 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs . . . facts . . jobs . . salaries . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. No obligation to you. So act at once. Just mail coupon.

**Big Book Free!** Send for my big book containing 150 photographs telling the complete story—absolutely FREE. H. C. LEWIS, President

## COYNE ELECTRICAL SCHOOL

500 S. PAULINA ST., Dept. B2-53, CHICAGO, ILL.

COYNE ELECTRICAL SCHOOL, H. C. Lewis, Pres.
500 S. Paulina Street, Dept. B2-53, Chicago, Illinois

Dear Mr. Lewis: Without obligation send me your big, free catalog and all details of Free Employment Service, as well as all details on your free Refrigeration Course, and how many "earn while learning." Also about your "PAY AFTER GRADUATION" offer.

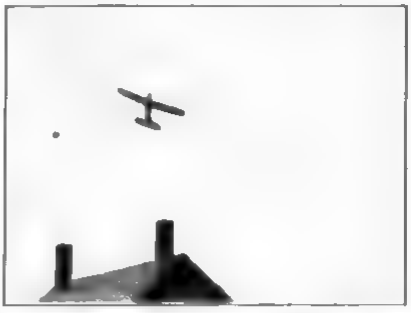
Name .....

Address .....

City ..... State .....

# ANDY'S SHOP MAIL BOX

*(Continued from page 28)*



This remarkable shot was made by Jarvis M. White and shows his home-made airplane model in full flight thirty feet above his home in Westlawn, N. J.

An intelligent echo of the recent feud as to what's wanted in the pages of this estimable family journal comes from Beryl Seeley, of Syracuse, New York.

I've had the thing on the spindle for some time now, hoping to get room to run it, as it is mighty interesting. However, the letter is as long as the average senior's Ph.D. thesis and I find I must condense it myself.

Seeley deposes and says as follows: he figgers the small boat fan hasn't been getting a break in this yere column. Wants a separate column on boats with some one else writing it.

He says, "Remember, there are a hundred fellows building flivver planes where there are over a thousand building small boats. At the present time I do not know of any magazine publishing plans and a column on small boats like you are on small planes."

Seeley also suggests: 1, a "C" class outboard hydro design; 2, a 12 ft. x 4 ft. speedster; 3, a 16 ft. inboard-outboard runabout; 4, dope on converting an auto engine to marine use.

* * *

To which Andy answers like this: Swell goin', there Seeley!

We are making no particular effort to favor any type of fan. Stop a minute and consider. All that a light plane bug can see in a magazine is light planes. All that boat bugs ever see in a mag is boats. We have only so many pages a year. We give you all we can. And there's some compensation in feeling that the cleverest ideas in the whole mech mag field are found right here on the M-M and MPM home lot, ain't they?

Take a look at our list of blueprints, and see what predominates, boats or planes.

And this month we add Bouncer to the list (see page 122) and something for the legion of baby car builders. Thus preserving for all time for you of the gang any plan you may want to build to.

Send for a list, you gents, if you want a bird's-eye view of past publications. Then get busy with a saw and hammer! S'long!

# Get on AVIATION'S PAYROLL!

## Let Me Show You How to

## EARN $60 to $100 a Week and UP in AVIATION!

My up-to-date home study Course gives you the ground work you need to *get and keep a real job* in this fascinating, fast growing industry. Scores of my graduates, who didn't know a thing about Aviation a few months ago, are holding down fine jobs right now—in the air and on the ground. *Over forty different types of jobs to choose from*, once you have this necessary training. Get the facts about my practical training, free Employment Service, and Money Back Agreement NOW!



**Walter Hinton**

First to fly the Atlantic; first to fly to South America; first to explore the upper regions of the Amazon by plane. Flying Instructor in Navy for five years. Now giving ambitious men **practical ground work training in Aviation at home.** If you are 16 or over, mail the coupon below for your copy of his big new FREE Book today

### I Teach You QUICKLY—at Home in Your Spare Time

You don't need to give up your present job—don't need to leave home, to get your training in Aviation. I've made it easy for you. I've put my own fifteen years of experience backed by over 400,000 miles of flying—five years of instructing in the Navy—all into my thorough, quickly mastered home study Course

### No Previous Experience Needed

You don't even need a high school education—don't have to know anything about planes or engines to learn the ground work of Aviation with my Course. Everything is clearly explained, illustrated by hundreds of pictures, drawings and charts—made as simple and easy as possible. You get all the information you need to pass the Government's written examinations for Mechanic's or Pilot's Licenses, in a few short months. If you want to learn to fly, I can save you many times the cost of my Course on your flying time at good airports all over the country.

**FREE AIRPLANE RIDE!**

Right now I'm making an offer of a free airplane ride to all of my students. Write me at once and I'll send you complete information. But now—to get in on this fine offer—while it is still open!

### I'll Help You Get a JOB, Too!

My nation-wide Employment Department is at your service—the minute you are qualified to accept a job in Aviation. We are constantly in touch with scores of airports, plane factories, etc., that want trained men. Free Book tells all about how I help my graduates get the kind of jobs they want! Mail the coupon now

### There's No Time To Lose—Get My FREE Book NOW!

Aviation is growing by leaps and bounds—while many other industries are slumping. Don't wait and let the other fellows get ahead of you. Think about your own future. Let me prepare you for a job paying $60 to $100 a week or more—in Aviation. Get the FACTS. Mail the handy coupon on the right today—right now—while you're thinking about it. I'll send you my big new FREE Book—packed with interesting facts about your opportunities in Aviation. Do it NOW.

**WALTER HINTON, President**
**Aviation Institute of U. S. A., Inc.**
**1115 Connecticut Ave. Washington, D. C.**

## Mail for my big FREE BOOK on AVIATION NOW!

**Walter Hinton, President,** 622-P
**Aviation Institute of U. S. A., Inc.**
**1115 Connecticut Avenue, Washington, D. C.**

Please send me a Free copy of your book, "Wings of Opportunity," telling all about my opportunities in Aviation, how you will train me at home and help me get a job.

Name .....
(Print clearly)

Address ..... Age.....
(Must be 16 or over)

City ..... State .....

# SHOP BLUEPRINTS

## for the HOME WORKSHOP FAN

**Every plan advertised on this page is a GENUINE blueprint. Do not confuse them with cheap substitutes printed on a printing press. These prints are faithful, actual-size reproductions of the draftsmen's original drawings. They'll survive rough usage in the workshop. Prints are large size, easy to scale off dimensions. Shipped postpaid at quoted prices.**

## BOATS

### GANNET—Ford-Powered

A deservedly popular boat plan. A 24-foot cruiser, powered with Model T Ford motor, driving her at around 15 m.p.h. Uses V-bottom hull, easy for amateur builder. Straight sides easy to plank. Bunks for two; plenty of room for provisions and duffle.
Price of prints . . . . . **$2.00**

### DOROTHY—A Cruiser

Primarily a power boat, designed for cruising economy, not speed. Good for 9 miles an hour with a 10 h.p. marine motor. Ford can be used if desired. Dorothy has a sail if the motor quits. She's 24-foot, plenty of cabin room for two or more; a real deep-water performer. Prints . . . . . **$2.50**

### PUNKIN' SEED

A small outboard racer, extremely simple to build. Cleans up in B, C, and D classes everywhere. Strictly a speedboat—easily portable. Prints . . . . . **75c**

### WANDERBOAT

An outboard runabout and cabin cruiser in one, light enough to move on a trailer. Good for 32-35 m.p.h. with a large outboard motor. Canvas covering which can be put in place in a jiffy gives you a weather-tight cabin for overnight stops. Prints **$2.00**

### WHIZZER—Air-Driven

A speedboat driven by an air propeller and a converted motorcycle engine of one or two lungs. Lots of fun and plenty of speed. Prints . . . . . **50c**

### KATUSHA—A Cruiser

Here's a big little 19-foot cruiser with a big double bunk and stern cabin. You can build her for about $100. Ultra modern, with stern drive engine. About the right size to tow on a big trailer for parts unknown and real adventure . . . . . **$2.00**

### WINK—A Race Boat

Here's a 125 cu. in. race job, over a dozen of which have been built. It is really an inboard motored hydroplane in the outboard size class. Plenty of speed; 40 miles an hour, and not hard to build.
Very pretty . . . . . **$2.00**

### TUBBY—A Sailing Scow

A 12-foot sailing scow, just the thing for boating fans looking for something simple to construct. Flat-bottomed, with leeboards—the acme of simplicity to build. Your choice of two sail plans—you can use her as a rowboat, too. Price of prints **$1.25**

### CANVAS CANOE

The simplest type for the amateur builder. Blueprints give all dimensions for a job you'll be proud of.
Price of prints, postpaid . . . . . **75c**

### M-M SPORT ROADSTER

Blueprints, with full instructions for building, on the amazingly snappy and inexpensive job described on page 158, this issue. Uses a motorcycle engine for power, chain drive—capable of 65 miles an hour, and looks like a custom built factory job at one-tenth the price! Price of complete prints . . . . . **$2.50**

### FORD SPEEDSTER BODY

Racing body for a Model T Ford or similar chassis. Wooden frame covered with chicken wire, then a layer of cotton batting held down by Fabrikoid (imitation leather) covering, makes this a ritzy-looking streamlined job. Costs but a few dollars to build.
Price of blueprints . . . . . **$1.00**

### CAMPING HOUSE-TRAILER

Just the thing for vacation-time—a trailer with beds and household equipment, with a collapsible canvas roof and sides which fold up when not in use. Four or more can sleep in her. Prints . . . . . **$1.00**

### LAKE CABINS

See ad on page 188 of this issue for descriptions. Seven designs to choose from; blueprints carry all specifications and needed drawings. Prices vary according to style chosen.

### SHORT WAVE RADIO CONVERTER

With this converter you can hear short-wave programs from amazing distances on your own radio set. Inexpensive to build—blueprints give full instructions as well as diagrams. Price of prints **$1.00**

### ROWING MACHINE

An ideal form of exercising machine that has won wide favor with readers; easily constructed from odds and ends. Price of blueprints . . . . . **25c**

## LIGHT AIRPLANES

### PIETENPOL AIR CAMPER

The country's most popular home-built plane. Carries two passengers, powered with Model A Ford motor. High wing monoplane. Cost of construction, including motor, well under $500. Blueprints show both wood and steel tube fuselages, and give motor conversion details. Hundreds of these prints have been sold with complete satisfaction. Price of prints . . . . . **$7.50**

### PIETENPOL SKY SCOUT

A mate to the Air Camper. Single place, powered with Model T Ford motor. Cruising speed, around 75 m.p.h. The most satisfactory light plane with this type of motor. Price of blueprints **$4.00**

**We will gladly send further information and description on any of these plans that may interest you.**

**Modern Mechanics and Inventions Blueprint Department,**
**529 S. Seventh St., Minneapolis, Minn.**

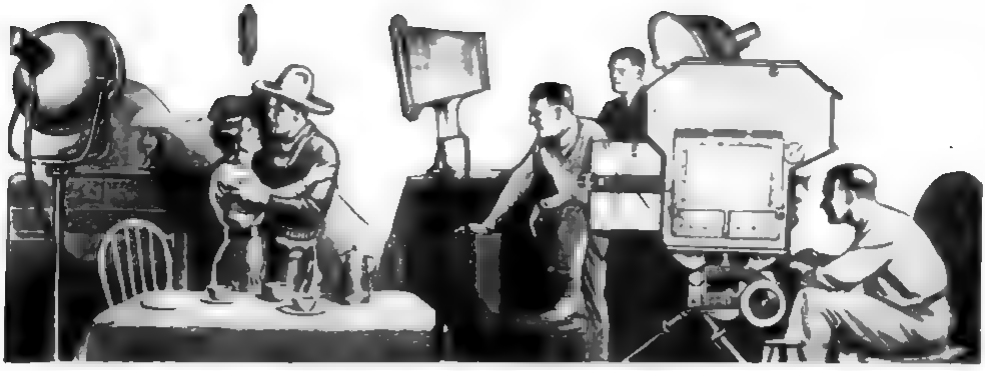
Gentlemen: Enclosed please find $ _____ in payment for blueprints of _____
to be shipped immediately, postpaid, to the address given below:

Name _____

Street _____ (Please PRINT plainly)

City and State _____

(Orders totaling $2.50 or over sent C.O.D. if desired, when one third payment accompanies order.)



# LEARN RADIO-TELEVISION TALKING PICTURES in LOS ANGELES

**Get your training in California where many of the famous Radio Stars make their home—where the great American Television Laboratories are located—and hundreds of trained Sound Engineers and Mechanics are employed in the Talking Picture Studios, Broadcasting Stations and Theatres of Hollywood and Los Angeles.**

## Railroad Fare Allowed to California

For a limited time we are allowing coach railroad fare to Los Angeles from any point in the United States. This is included in and deducted from your tuition, so the trip costs you nothing extra. Take advantage of this opportunity to visit Los Angeles and Hollywood, and prepare for a good paying Radio job at the same time. Mail coupon for full details.

### PRACTICAL SHOP TRAINING

**At the Oldest Trade School in the West**

For over 25 years National has been training men by the practical shop method. Over 20,000 ambitious men from all over America have come to National for their training. You'll find National graduates working in the famous Studios of Hollywood, in Talking Picture Theatres, great Broadcasting Stations, for Radio Manufacturers and Dealers, while many have gone into the Radio business for themselves and are making big money as their own boss. What they have done, you should be able to do! Mail coupon for proof!

### MANY JOBS WILL BE OPEN

10,000,000 Radio sets to be constantly serviced! 600 Broadcasting Stations employing trained Operators and Mechanics! 10,000 Theatres equipped for sound and the job only half done! Eight stations already sending out regular Television programs! New jobs will be opening up every day—hundreds of golden opportunities for the trained man. And you can prepare for them in 4 months at National!

### FREE EMPLOYMENT SERVICE

**Many Earn While Learning**

When you've finished National Training—four months of practical Shop Work in the great National Television, Talking Picture and Radio Shops,—then National's Employment Department will assist you in every possible way to get the job you want. And if you're short of money, after paying your tuition, we will gladly do all we can to help you get part time work to pay your room and board while at school.

### MAIL COUPON FOR BIG FREE BOOK

Get all the facts! Mail coupon below for our Big Free Book, telling all about National's famous Shop Training and the many jobs opening up in these fascinating fields. No cost or obligation! Just mail the coupon.

**NATIONAL TELEVISION, TALKING PICTURE and RADIO SCHOOL**
**Dept. 73-E**
**4006 SO. FIGUEROA ST., LOS ANGELES, CALIF.**

National Television, Talking Picture and Radio School,
Dept. 73-E, 4006 So. Figueroa St.,
Los Angeles, California.

Please send me your big new Free Book on Television, Talking Pictures and Radio, and full details of your Railroad Fare offer.

Name_____

Street No._____

City_____ State_____

# FLYING TANKS *that*

Here is the fuselage or body of the flying tank under construction. It is surprisingly light in weight, thanks to methods of construction which are jealously guarded. J. Walter Christie, noted builder of army tanks, is the man inside the body who is pointing to the plans. Caterpillar treads can be fitted over the wheels, to be used when necessary.

**Imagine those two formidable weapons of modern warfare, the airplane and the armored tank, combined into one terrible machine of destruction! Fantastic as the idea sounds, it is fast taking physical shape as a reality for Uncle Sam's army. The whole amazing story is presented to you in this important article.**

IS WAR, already made terrible to contemplate by the invention of too-efficient methods of destruction, on the verge of being banished forever by an amazing new weapon so horrible in its possibilities that nations of the world will not dare to risk its fury?

This is the idea conjured up by J. Walter Christie, noted builder of tanks for the U. S. Army, who has been secretly working on the most revolutionary war invention since the discovery of gunpowder –an armored tank which flies as swiftly as a bombing plane, and which, by simply shedding its wings when on the ground, can travel over any terrain with guns blazing at speeds of 70 miles an hour!

### Changes Modern War Strategy

The entire strategy of modern warfare will have to be altered when Mr. Christie's flying tank is proved practical. Trench warfare, which played such an important part in the World War, will be well-nigh impossible, for with a swarm of a hundred flying tanks descending into No-Man's Land, no infantry in the world could resist the withering fire.

Nor is the flying tank so grotesque an idea as might appear at first glance. During the late war no one even conceived the possibility of an armored tank's being propelled through the skies on wings like an airplane, driven by an airplane motor.

### Flying Tank Now Being Built

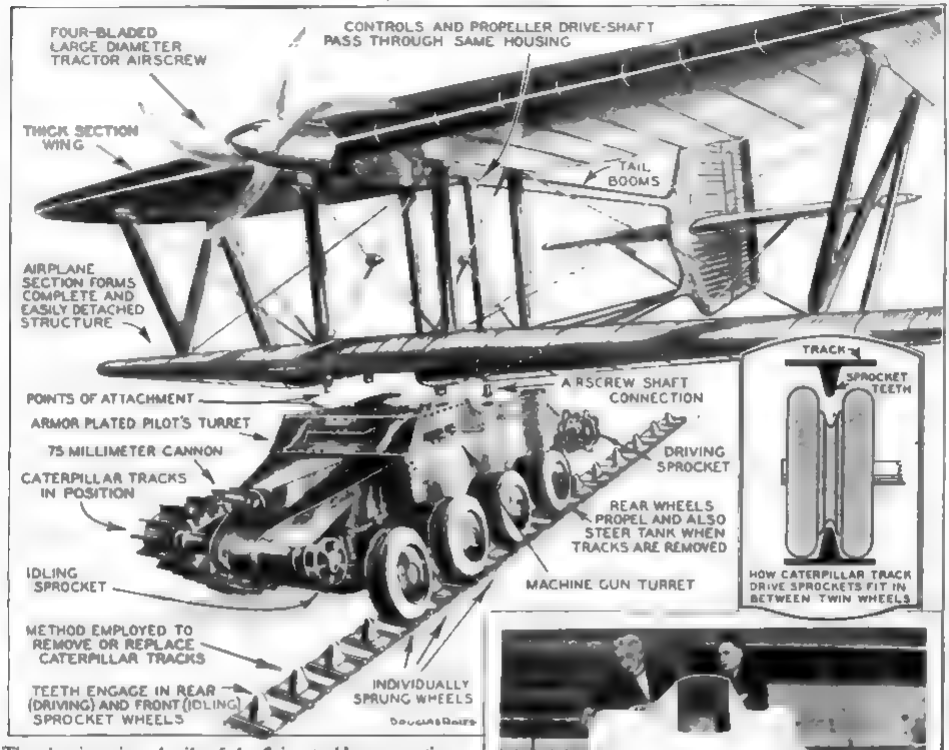
Yet Mr. Christie's tank, he promises, will do precisely that. Because of his success in building speed tanks for the army and his extensive knowledge of this phase of warfare, there can be no doubt that he knows just what he is doing. He is not a man given to exaggeration, and the fact that the tank is now taking shape in the plant of the United States Wheel Track Layer Corp., at Linden, N. J., proves that the idea has advanced beyond the paper and plan stage.

In the words of the inventor, "The flying tank is a machine to end war. Knowledge of its existence and possession will be a greater guarantee of peace than all the treaties that human ingenuity can concoct. A flock of flying tanks set loose on an enemy and any war is brought to an abrupt finish."

Details of the tank's construction are

# Shed Their Wings!

by LEW HOLT



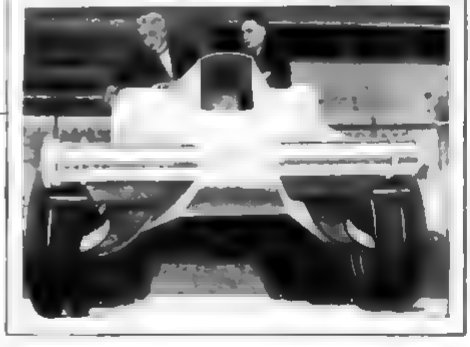

**This drawing gives details of the flying tank's construction. Note how the flying structure can be shed at will, leaving the tank unit fully equipped for combat and capable of traveling 70 to 100 miles an hour, depending on terrain.**

astonishing. The flying fortress will be armed with a 75 millimeter gun, with supplementary small machine guns. Personnel will consist of two men. The body of the flying tank is amazingly light because of new principles of construction closely guarded by the inventor. In fact, the finished product, ready for military duty, will not weigh over four tons.

Its lightweight engine can develop 1000 horsepower, and by an ingenious system of gearing the motor drives both the back axle, for propelling the tank on the ground, and the propeller for flying duty.

### Take-off Problem Solved

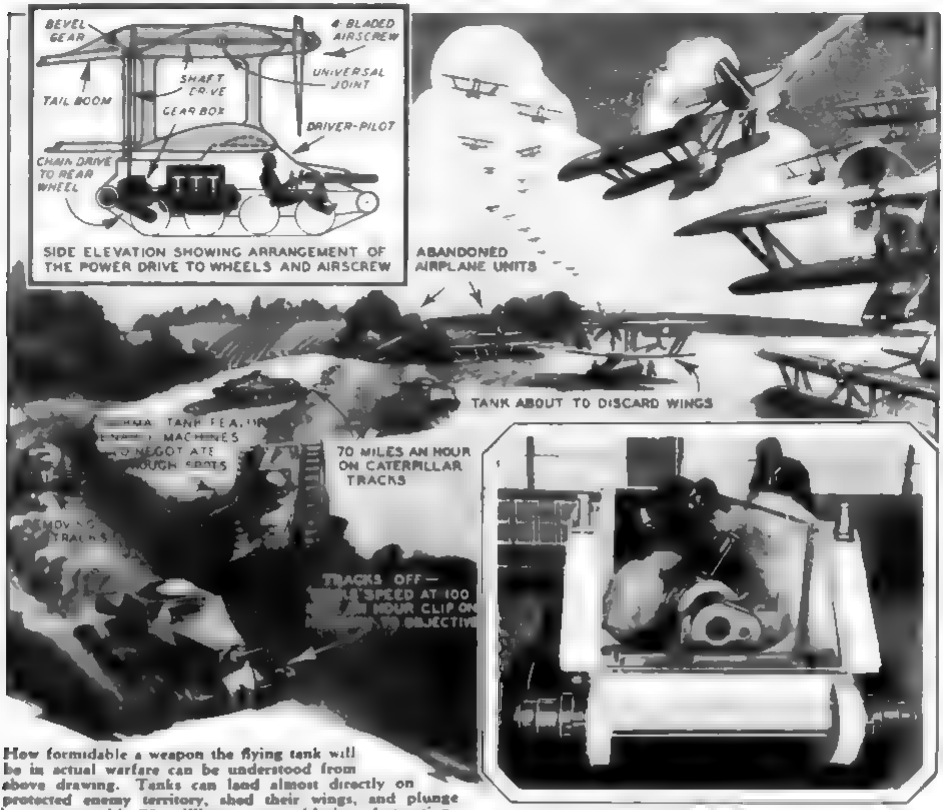
Eight large wheels are provided on the tank, with twin pneumatic tires over which the caterpillar tread fits. With the special springing equipment, pneumatic tires and patented caterpillar track, Mr. Christie's tank can make 70 miles an hour across rough country, it has been calculated, and as much as 100 miles an hour on a smooth surface. Its speed makes it a difficult target for enemy fire.



**Front view of the tank. Caterpillar treads can be attached to the wheels, as diagrammed above, or the machine can proceed on its eight twin-tired wheels.**

"It is an established fact that a single pair of wings can support this tank in the air," Mr. Christie explained to the special representative of MODERN MECHANICS AND INVENTIONS. "Any aviator can tell you in two minutes the exact wing spread required.

"The most serious difficulty seems to be the take-off. Several of my flying friends have told me that many army planes require three-quarters of a mile of prepared ground for a runway and they insisted that my machine would need a still greater starting space. There were also those who doubted that my tank would even leave the ground.




**How formidable a weapon the flying tank will be in actual warfare can be understood from above drawing. Tanks can land almost directly on protected enemy territory, shed their wings, and plunge into action with 75 millimeter guns blazing destruction.**



**View of motor installation in the flying tank, looking from the rear. Note the transmission unit in the foreground for carrying power to propeller in the wings. Two shafts for securing the tank to the wing units can also be observed on the top of either side of the body.**

"After three years of experimentation, I was prepared to meet their queries and their doubts. This is the solution: My machine will work up to a flying speed while it is still on the ground. At a hundred yards the tank will be going fast enough to rise the moment the power is transferred from the wheels to the propeller, no matter on what kind of surface the tank is traveling.

"The caterpillars will function on any condition of base. The Christie speed tank which has been already acquired by the United States government bears testimony to that advantage.

**Treads Simplify Landing Problem**

"The other hazardous stumbling-block, the landing of the flying tank, has also been overcome. My machine can alight on very limited space. The pilot can observe his air speed by means of his instrument board. When he switches from being a pilot to being a chauffeur he will know his land speed, both on the caterpillar tracks and on wheels, whichever he may choose to bring into use.

"All that the man at the controls has to do is to start the wheels of the caterpillar in motion and adjust them to the air speed. This is done merely by keeping an eye on the speedometers. As soon as the tank touches the ground, he brakes it as he would an auto truck.

"If he wants to liberate the tank from the wings, he has only to press a lever and that operation is completed in a jiffy. Then if he wants to, he can proceed along a highway on the rubber-tired wheels at a rate of 100 miles an hour."

That is how Mr. Christie's latest invention will work. But he has already begun to plan for a further improvement on this device. He will soon begin work on a detachable airplane as applied to the armored tank. The plane will deposit the tank at a desired post and then return to bring up others, or engage in other maneuvers.

In connection with these latest experiments, a valuable peacetime use of the flying tank principle suggests itself.

One of the several problems confronting passenger air lines today and, from the passengers' standpoint, certainly the most annoying, is the business of getting passengers to and from the airport—the actual

point of arrival and departure of the airplane itself.

Airports are perforce located at a considerable distance from the downtown district of a city and it naturally follows that the larger the city the more inaccessible will be the airport or air terminal. In the minds of prospective air passengers the immediate accessibility of bus and railroad facilities contrast pleasantly with the annoyance attendant on purchasing a ticket, riding out to a field, transferring to a plane and repeating the performance at the flight destination.

The time-saving feature, most practical appeal of air travel, is thus not so much in evidence or even may be totally absent in flights of less than 300 miles.

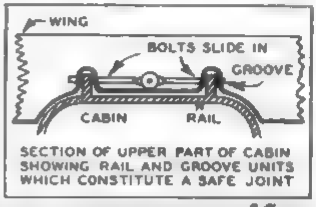
### Bringing Airports Close to Town

Several remedies for the situation are feasible. One, and the most frequently heard of, is to build airports in the heart of a city, by utilizing the tops of large buildings with or without the aid of catapult launching devices, by spanning whole blocks of streets with wide bridge-like structures or spanning convenient rivers in a similar manner. All these ideas have been mentioned at different times. All of them suffer from one common disadvantage.

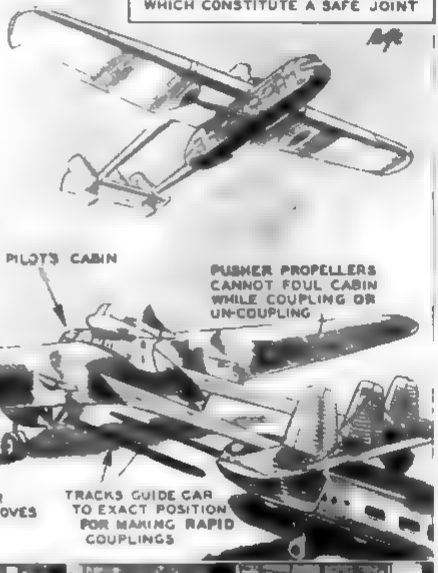
To bring an air terminal into the heart of a city would not only result in air traffic at an altitude we are obliged to regard as unsafe, but would further imply taking off and landing over these crowded centers. The airplane of today is hardly suited to operating under the conditions just outlined and therefore this otherwise attractive solution of the problem must, for the time being at any rate, be abandoned as a serious consideration.

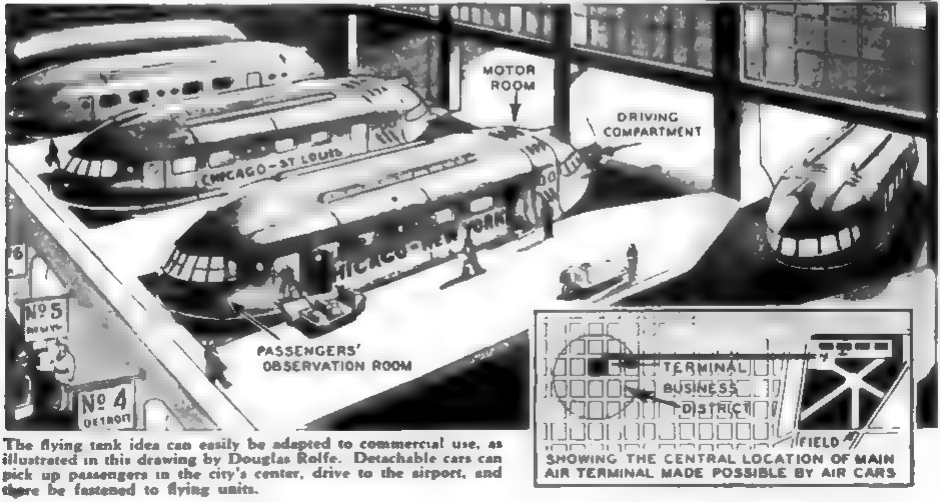
Another course is open and fantastic as it may appear at first glance the idea has been approached a number of times and there are no serious difficulties in the way. The idea involves the building of passenger planes in two distinct and self-contained units. One, the airplane portion, would

*(Cont'd on page 170)*



SECTION OF UPPER PART OF CABIN SHOWING RAIL AND GROOVE UNITS WHICH CONSTITUTE A SAFE JOINT

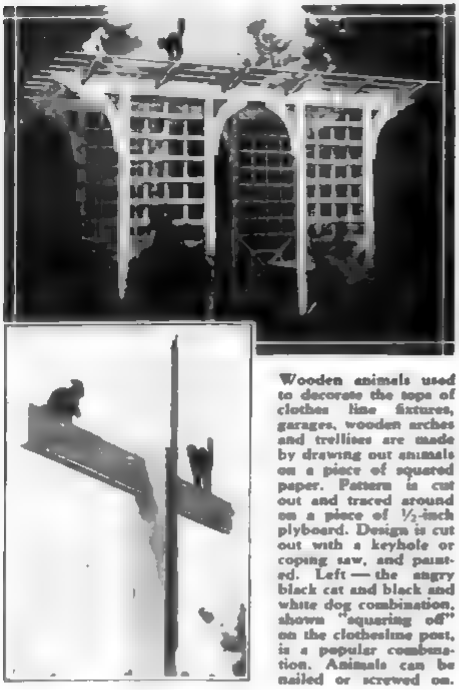


The flying tank idea can easily be adapted to commercial use, as illustrated in this drawing by Douglas Rolfe. Detachable cars can pick up passengers in the city's center, drive to the airport, and there be fastened to flying units.

SHOWING THE CENTRAL LOCATION OF MAIN AIR TERMINAL MADE POSSIBLE BY AIR CARS

# Wooden Cats and Dogs Add Novelty to Yard Fixtures



Wooden animals used to decorate the tops of clothes line fixtures, garages, wooden arches and trellises are made by drawing out animals on a piece of squared paper. Pattern is cut out and traced around on a piece of ½-inch plyboard. Design is cut out with a keyhole or coping saw, and painted. Left — the angry black cat and black and white dog combination, shown "squaring off" on the clothesline post, is a popular combination. Animals can be nailed or screwed on.

A TOUCH of novelty can be added to your garden trellis, clothes line support, garage roof or lattice arch by turning out a few wooden animals in your workshop, and fastening them on top of the fixture as illustrated in the photos at the left.

When making these ornaments, it is best to draw the animal, or animals, on a piece of squared paper first. Then, after cutting out the pattern with a scissors, place it on the wood stock to be used (½-inch plywood is very satisfactory) and draw around it with a pencil. This will aid when cutting out the animal, which is done with a key-hole or coping saw.

The animals are then sanded smooth, painted and nailed or screwed to the fixture. Black and white is a good combination to use on cats and dogs. Other animals which might be used in combinations or individually are rabbits and squirrels.

## No 'Hunting' for Luminous Switch

EVERYONE knows "just about" where the light switches are located in the various rooms of their home. Yet when reaching for them in the dark they are not always so easy to find; often resulting in vases, chairs and other articles placed near them in the room being tipped over and broken in the "hunt."

Luminous spot on switch cap shows up plainly in dark room.

Shown on the left is a little clamp that fits over any ordinary wall switch. This has a small dot of luminous paint on it which can be readily seen in the dark, thus eliminating any uncertainty when reaching for the switch in any room.

## Grass Seed Sown Evenly, Quickly

GRASS-SEEDING time usually means backaches from bending over trying to sow the seed evenly. With a device now being marketed, shown below, 100 pounds of seed can be sown evenly in 30 minutes and all the operator has to do is walk along guiding the seeder box.

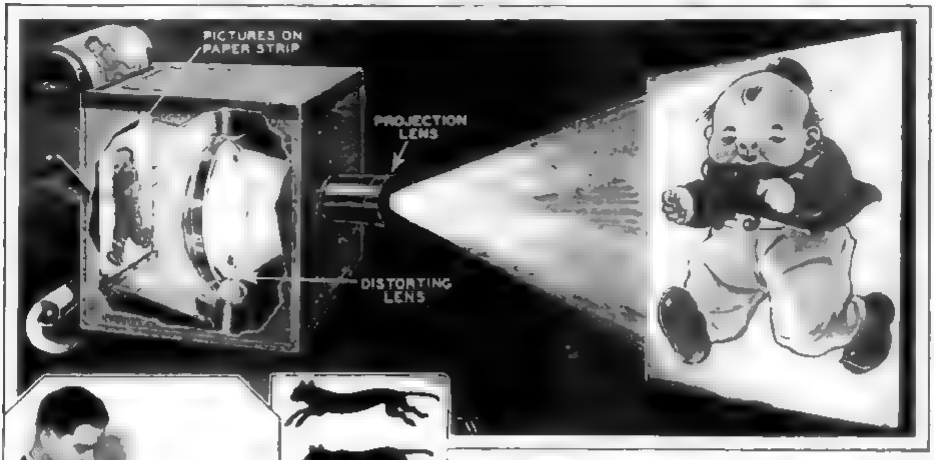
The seeder is of simple construction, having no gears or agitators, and works equally well when run forward or backward. Handle is adjustable so that anyone can push the seeder without bending.

When pushed over the lawn, device sows grass seed evenly.

## Akron's "Hair" Specially Combed

THE *Akron* had to have its "hair" combed smoothly from fore to aft and then stuck down tightly before it could attain its maximum speed of over 80 miles an hour. The nap was fitted into place in long, carefully tailored strips and after being combed, was painted first by hand, each stroke being from fore to aft, to eliminate any possibility of air resistance which would cut down the speed.

# Distorting Lens Animates CARTOONS




By rotating a distorting lens in the projection machine, reflection of drawing in camera appears to move and take on various shapes and proportions when focused on screen.

Distorted lenses give figures animation by changing them in rapid succession from fat to thin; large to small, etc.

HAVE you ever stretched the drawings on a rubber apron to make them take various shapes and proportions? Or blown up a balloon on which was a design and watched it grow more and more distorted?

This same effect is achieved from a drawing by means of distorting lenses in a new projection machine, shown above, recently invented by Maurice E. Morris, Ogden, Utah. When turning the crank, which revolves the lenses, the object is made to appear in various animated shapes due to the action of convex and concave mirrors.

The principle of the action or optical illusion is simple. A demonstration of this method of inducing a distorted form from a normal image is for a person to stand before a partially convex or concave mirror; the mirror having in its surface the definite object.

Then when mirror is rotated, an indefinite number of different poses are reflected by the distortion of the object so that complete revolution of the mirror has the appearance of making the object itself move, or assume action.

With these lenses in a box-shaped camera, shown above, an entire comic feature or caricature can be thrown on the screen.

## Electrically Heated Screen and Foot Pad Take Chill From Cold Room

CHILLING surfaces, cold, damp walls and frosty windows need no longer bring discomfort to the home or office. All their icy darts are robbed of their sting by a new electric screen and pad, shown on the right, which have just been constructed by L. W. Schad of East Pittsburg, Pa.

Connected to a light socket by an extension cord, the electrically heated screen serves as an auxiliary radiator and can be moved anywhere about the house or placed between your desk and the window, where it will heat the room and also protect you from the draft. The chilling effect of cold floors is eliminated when standing on one of the heated pads which, like the screen, can be moved about as desired.

Chill and dampness are taken out of the room by the electrically heated screen (portable radiator) and foot pad.

# Linotype Operated Like Typewriter With New Keyboard

With this simplified keyboard attachment fastened above linotype keyboard any office stenographer can set type.

THE unique position and the pretentious array of keys on the linotype have been radically simplified by the invention of a new keyboard which automatically qualifies accomplished typists as potential linotype operators.

Shown attached to the type-setting machine in the photo on the left, the new apparatus consists of a simplified keyboard comparable in number and location of keys to that of a standard typewriter. The attachment weighs but thirty pounds and all the linotype keys can be tripped by operating the levers on the new board.

The action of releasing the matrices from the chambers is all done electrically, the power being derived from a light socket.

## Electrocuted Live For Half Hour

DR. SAMUEL R. BENEDICT, chief surgeon of the Alabama Power Company, has announced his conclusion that death by electrocution is not immediate. In fact, the electrocuted person's heart keeps on beating for thirty minutes or more, during which time, resuscitation is often possible.

## Reason for Stiff, Painful Backs

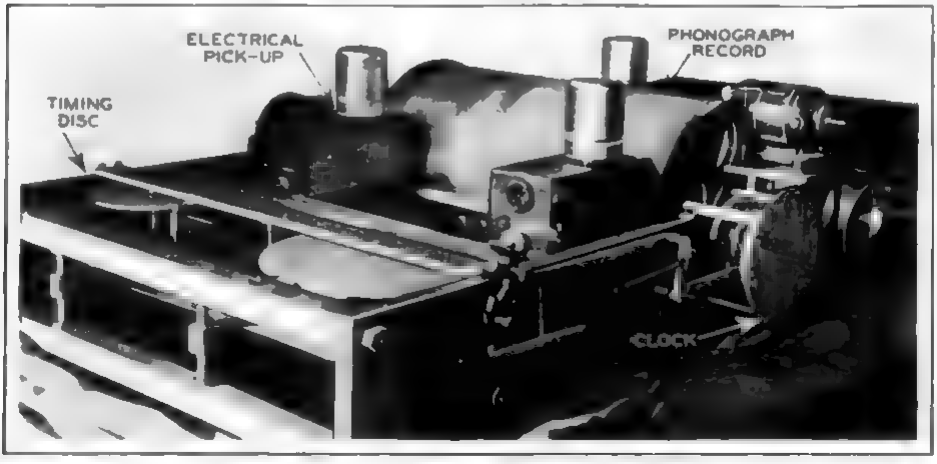
THE reason that so many elderly women develop stiff or painful backs and must walk gently to avoid harmful shocks to their head, neck or shoulders is explained from the study of more than 7,000 human backbones. The reason is that elderly women usually continue to do more or less physical work around the house and thus administer thousands of small shocks to their spines daily.

These shocks crack some of the disks of cartilage between the vertebra of the backbone so that a compressed half-liquid material which exists inside the cartilage, and makes the backbone springy, may leak out, like the air from a rubber cushion.

## Paris Clock Talks Time by Telephone in Hours, Minutes, and Seconds

THREE synchronized talking films attached to the mechanism of the clock shown below, which is installed in the Observatory of the Bureau of Longitudes, Paris, talk the time over the telephone whenever a Parisian phones to inquire.

The three films, which speak the hour, minute and second, respectively, are connected to the clock mechanism the same way as the visible indicators already in use are attached. They are automatically adjusted every ten seconds.




Electrical pick-up with photo-electric cell announces time over phone from talkie film wound like cylindrical record.

# Opening, Closing Hand Operates Tropical "Electric" Fan

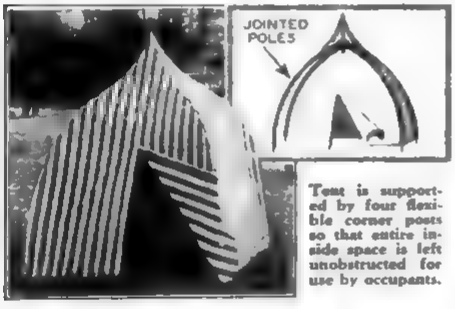
INHABITANTS of the tropical countries where electricity is an expensive luxury have developed the little hand-propelled fan which Tallulah Bankhead, movie actress, is seen operating in the photo on the right.

The device consists of a four-bladed propeller fastened on a handle so it can be spun around. A piece of wire is bent, as shown, and attached to handle. Whirling motion of the propeller is produced when wire is pushed back and forth along blades. This action is obtained by flexing and contracting the hand.

Thin wooden fan is kept spinning by motion of wire lever which pushes blades when hand is opened and closed.

## Camping Tent Has No Center Pole

CAMPERS have long wished for a tent that could be set up without the use of a center pole. Below is shown the "Tela Tent," recently patented in Stockholm, Sweden, which, as the accompanying diagram shows, is supported by four flexible corner posts assuring completely unobstructed inside space.

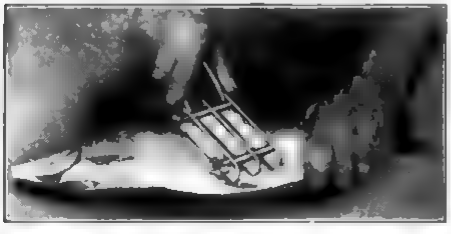



Tent is supported by four flexible corner posts so that entire inside space is left unobstructed for use by occupants.

## Fish Scaler Has Triple Blade

SCALING fish with an ordinary knife is a rather long job, but with the three-bladed scraper shown below, it becomes a simple task. The device consists of three blades, each held one inch apart by bolts and spacers, attached to a convenient handle.

Instrument is used as a regular knife, but works three times as fast. The blades are held straight up and down, preventing them from digging into the meat. It is easily taken apart and cleaned.



Scaler blades are held upright so they cannot cut meat.

## Water Glider Floats on Rollers

POWERED by a 9 horsepower motor, the novel water glider shown in the photo below attained a speed of 140 kilometers an hour in a recent test at Suresnes, near Paris. The boat is buoyed on three barrel-shaped floats which revolve when craft is in motion. Propeller attachment mounted in front of boat adds to the pulling power of the motor.

This water glider moves on revolving floats and is powered by a 9-horsepower motor. It goes 140 kilometers an hour.

## Bees Taste Sugar With Nose, Legs

EXPERIMENTS of Prof. Dwight E. Minnich of the University of Minnesota have established the fact that bees can taste sugar either with the antennas which project from their head, or with the foremost pair of their six legs.

Presumably, this ability is useful in determining whether or not there is sugary nectar in the flowers.

# Living LIGHT Effects

General view of the buildings of the Chicago World's Fair, to open in June, 1933, with prominent structures pointed out. Stretching for three miles along the city's lake front, the structures are remarkable for their modernistic design.

*by* WILLIAM J. HARRIS

**Gigantic waterfalls cascading down the sides of buildings—huge towers of living flame—buildings glowing in all the brilliantly flickering shades of the rainbow—these are among the marvelous lighting effects created for the Chicago World's Fair, all produced by methods so simple that the amateur constructor can easily duplicate them as described here.**

WHEN the giant telescope at Yerkes Observatory picks up a flash of light from the star Arcturus on the night of June 1, 1933, and flashes it as an electrical impulse to Chicago to start the second Chicago World's Fair it will turn on, among other things, the most amazing collection of electrical effects the world has ever seen.

### A Waterfall of Light

And, strangely enough, the marvelous decorative devices being developed in the electrical laboratories of the Chicago Century of Progress Exposition are so simple anyone can build them—for home decoration, store display, theatricals or other uses.

Imagine a great building with fantastic, modernistic towers and domes, set off by tall columns of glowing light in all the colors of the spectrum. Examine the columns and the visitor to the fair will discover a few yards of celluglass—which is common wire window screening with the pores filled in with an acetate compound—a few cents worth of ordinary electric light globe lacquer, some odds and ends of boards, ordinary porcelain light sockets and tin reflectors, and plain, uncolored light globes.

Down one building in the electrical group will pour a brilliant waterfall, tumbling from a height of 50 feet. A closeup will disclose that the "water" is light, and the whole device consists of some wall board, more celluglass, a few yards of common chicken wire, some ordinary brown wrapping paper, a quantity of Christmas tree tinsel snow glued to cloth, and a small electric motor.

### Metal Flowers Glow With Invisible Light

By day the grounds will be beautified with huge beds of brilliant flowers, but by night the same beds will appear equally beautiful. The daytime beds will be natural, growing plants. But scattered among them will be duplicate flowers made of metal, treated with chemical paints which become fluorescent under ultra-violet light.

# Marvel of World Fair

View of the Administration building, as seen from the lagoon. Note the flat surfaces and predominating straight-line effects which lend themselves admirably to the light-decoration treatment described in the accompanying article.

Huge ultra-violet projectors playing across the flower beds at night will pick out the artificial flowers, and make them glow in all the brilliant coloring of the real specimens by day.

Fantastic floral and decorative designs on building walls and columns will be painted in the same way. Hidden lights in various colors, the light values rising and falling as the resistance values in the lines are automatically changed, will sweep bands of color across the columns, then, as the lights fade out, the ultra-violet projectors will pick out the fluorescent designs.

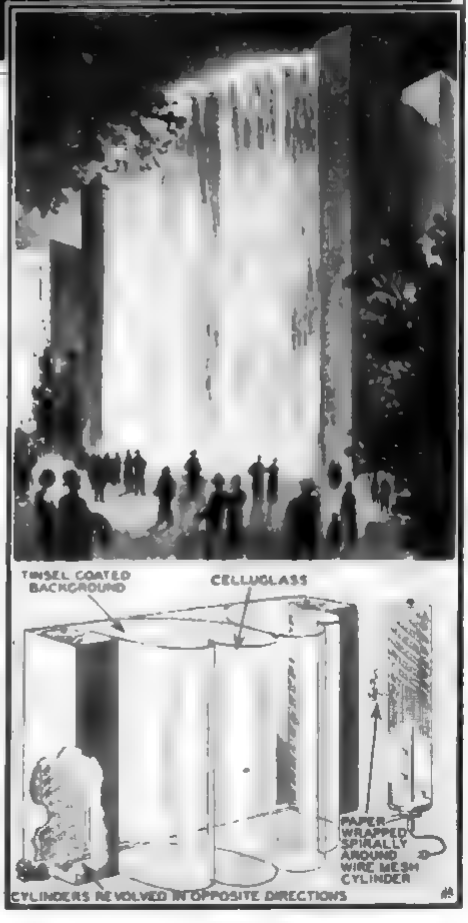
### Towers of Living Flame

Towers of dancing flame are being prepared, and again the celluglass, some half cylinders of glass, partly frosted with liquid frosting, some rags of red silk, an electric fan and plain lights turn the trick. The red silk, dancing in the breeze from the fan, provides the illusion of flickering flames.

The huge false windows of the transportation building, each window more than sixty feet high, will appear at night as a kaleidoscope of dancing colors. Hidden between the glass of the window and a false background will be projectors carrying several colors of lights, playing on a background studded with nails, on each nail hanging a four-inch square of polished aluminum, while electric fans at the base cause the metal squares to vibrate and reflect moving light beams.

### Colors Painted by Light

The buildings of the huge exposition, which will stretch for three miles along the Chicago lake front, are remarkable because they are quite unlike those of any other fair ever staged. They represent the last word

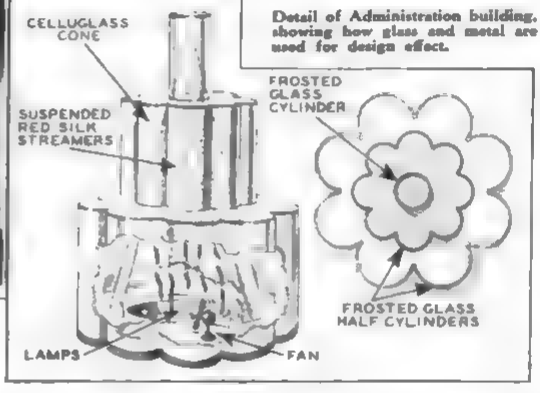



The drawing shows the dazzling effect of a waterfall cascading down the side of a building. Escaping through a wire mesh cylinder wrapped spirally with wrapping paper, the light strikes a background of tinsel and is reflected to the celluglass cylinders, giving an illusion of falling water.

## "Tower of Flame" Presents Effect of Conflagration Without a Bit of Fire

Red flames flicker and dance constantly in the heart of this amazing tower of flame, but there's no fire—the effect is produced by lights playing on dancing streamers of red cloth in the manner shown in the drawing at the right.

Detail of Administration building, showing how glass and metal are used for design effect.




in modernistic architecture. Instead of the built-up carved and plaster effects of the so-called "classic" architecture of the famous Chicago fair of forty years ago, there will be huge expanses of plain, unadorned surface, painted in brilliant colors, which, at night, by the use of lights in various colors as well as ultra-violet projectors, will appear to shift constantly through a wide variety of colors and shades.

### How the Effects Are Secured

Sixteen thousand kilowatts is the estimated connected load when the lights go on next June. Cables are being provided, however, to carry more than that amount, to care for additional effects that may be developed.

Now for the story of how some of the effects are built—a system so simple it can be easily copied for other purposes.

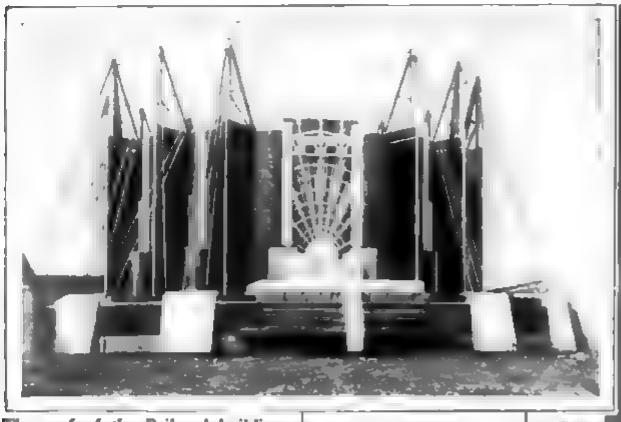
Glowing columns of light, explained in detail in one of the accompanying drawings, are easily made. The celluglass, which costs approximately eight cents per square foot, comes in yard widths. These are bent, the edges overlapped slightly, and wired to form a cylinder. The cylinders, cut in different lengths, are painted with ordinary lamp bulb color lacquer. With the quantity production necessary for the fair dipping vats are used. A paint brush can be substituted—but experiments with spraying were a failure, as it was impossible to get an even coating.

Several cylinders can be mounted on one base, or each can be provided with a separate wooden disc for base, and a tin shield bent around it, coming high enough to hide the lamp and reflector. A top, either of tin or wood painted black, cuts off the light without causing reflections which would produce a bright spot.

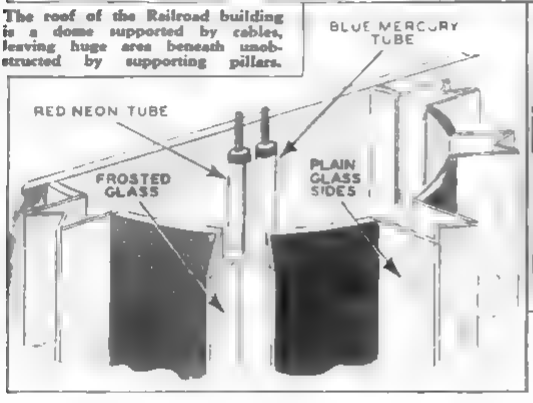
### Waterfall Not Hard to Make

The electric waterfall is a more elaborate effect, but not difficult to produce. It can be produced in any desired height, while a width of approximately six feet gives the best results. The front consists of curving segments of celluglass, left in its natural color. The back and ends are of wall board, while the curving baffles are of cloth, sprinkled with Christmas tree tinsel "snow." At either end a cylinder, 10 to 12 inches in diameter, and made of wooden disk ends with sides of common chicken

## *Cable-Suspended Dome of Railroad Building Eliminates Supporting Pillars*



The roof of the Railroad building is a dome supported by cables, leaving huge area beneath unobstructed by supporting pillars.



The effect of Grecian pillars with glowing rose-red flutings up the sides is secured by the ingenious lighting arrangement diagrammed at the left. Inside of pillars is painted dead black so that light escapes only through frosted glass.

wire, half-inch square mesh, is mounted to revolve on a fixed shaft of half-inch gas pipe, the light wires being led in through the shaft, as shown.

Around the cylinders inch-wide strips of common brown wrapping paper are wound spirally, spaced an inch apart. A small electric motor is belted to a pulley on the base of one cylinder, and a crossed belt provides a drive from this to the second cylinder. The motor should be geared down so the cylinders revolve at approximately 40 to 60 r.p.m. As the cylinders revolve the bands of light escaping between the paper spirals sweep downward across the tinsel snow, giving the illusion of falling water.

### Red Silk Gives Fire Illusion

One of the more expensive effects is the tower of flame. Its cost is due to the use of real glass semi-cylinders, although celluglass could be substituted, with some loss in the effect. A cone of celluglass is placed inside the tower to break up air current eddies which would form at the step backs in the sides. The red silk, suspended from the top of the cone and secured at the base, gives a very realistic effect.

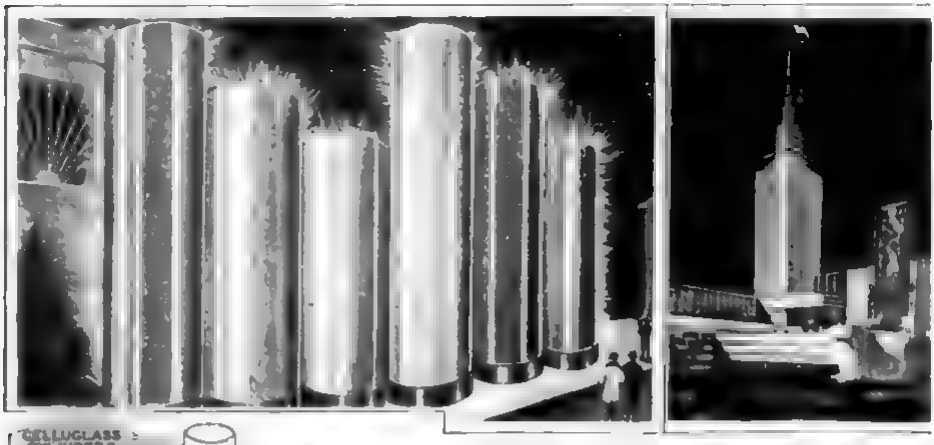
Another illustration shows a novel application of the "edge light" principle used to some extent in signs. Two light tubes, one filled with neon and the other with mercury vapor, are mounted at the center of a hollow column. The mercury tube is used to kill the harsh red light of the neon, the two together giving a soft rose glow.

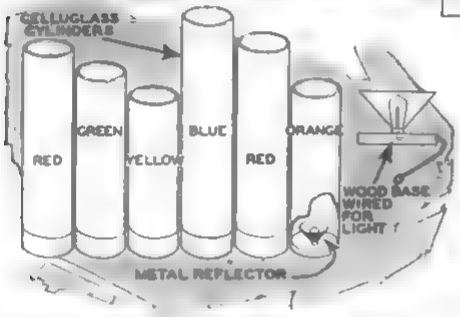
### Pillars Fluted With Rose Light

In slits in the column surface two strips of common double-strength glass four inches wide are mounted, three inches apart and parallel. Two smaller strips of glass, frosted by sand blasting on the inner side, are mounted at 45-degree angles to close the gap between them, as shown. The inside of the column is painted a dead black.

So long as the inside is properly black and the tubes are placed in the exact axis of the column no light can escape through the plain glass sides of the projecting ornaments. Only the frosted edge segments pass light, as shown in the shaded portions, and the resulting effect is that of a sculptured Grecian column, with glowing rose light substituted for the corrugations of the marble.

The combination of mercury and neon






How simple modernistic lighting effects are secured. Cylinders are of celluglass (wire filled with acetate compound), dipped in colored paint and nailed to wooden disks containing ordinary light bulbs. Grouped in random heights and colors, the effect is striking.

Left above, simple cylinder light effects. The building above is architect's drawing of interior court of the Hall of Science. Note the carillon-equipped tower, the rostrum at the right, the decorated cloth banner which serves as a background for the speaker, and the three levels on which the structure is built.

tubes will be general throughout the fair, the illuminating engineers considering the resulting soft rose color more attractive than the harsh red of the neon alone.

One of the unusual effects being developed is a series of modernistic "trees" with trunks and branches of shifting changing light. Wallboard "V's" will be mounted vertically against building walls. At the point where the two sides meet vertical slits a few inches wide will be cut, backed with glass, and then closed up the center, as shown in one of the drawings, with narrow strips to divide each slit into two parts.

### Tree Built of Light

Branches, formed in the same way, will project at right angles, turning up to form "L's". Inside the "V" a neon and a mercury globe, mounted back to back on a shaft connected to an electric motor, will slowly revolve. From the outside the trees will change color constantly, from red to rose to blue to rose and back to red again, depending on whether one tube is facing the surface, or both are transmitting a portion of the light.

The same idea, it has been suggested, might be applied to a modernistic Christmas tree, formed of three tall triangles of wall board, joined to form a triangular pyramid, with the trunks cut in the center of each side, and branches radiating toward the corners, as the sketch shows.

One of the unusual effects being developed provides dimming control for neon and similar tube lights. Red, blue and green lights will be mounted in alcoves along the wall. Carbon pile dimmers will make it possible to produce practically any color by dimming and mixing the three primary shades.

### Inside Lighting Artificial

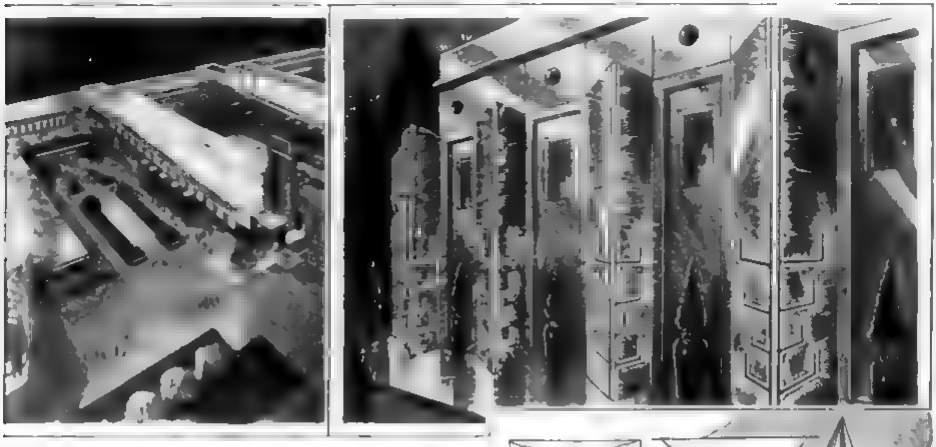
Existing boulevard lamp standards lining the park drives in Grant and Burnham parks, the area included in the exposition grounds, are to be brought into harmony by adding modernistic decorations to the lamp standards. A half dozen different types of decorations have been developed to be mounted around the large globes on top the standards.

Inside illumination of the exhibition spaces is to be entirely artificial, so that each exhibitor can control the lighting of his display to the best advantage. The lighting fixtures of the booths, and the corridor lights and illuminated signs will all follow the general scheme of modernistic decoration.

Marvels of the World's Fair are by no means confined to the lighting designs. All of the buildings are interesting not only for the modernistic nature of their architecture, but because they have been so erected that when their temporary purpose has been served, they can be pulled down and the building materials salvaged for other purposes.

Practically the entire Fair is built on ground reclaimed from Lake Michigan—

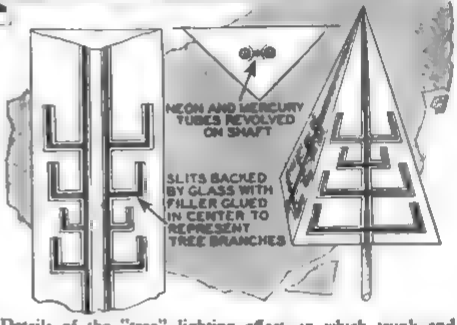
## *Combination of Mercury and Neon Tubes Gives Soft Rose Light Effect*



Architect's rendering of the General Exhibits group, with drawing of the modernistic "tree" lighting effect at the right. White and gray will predominate in color scheme of this group of buildings, which at night will be bathed in constantly changing colors.

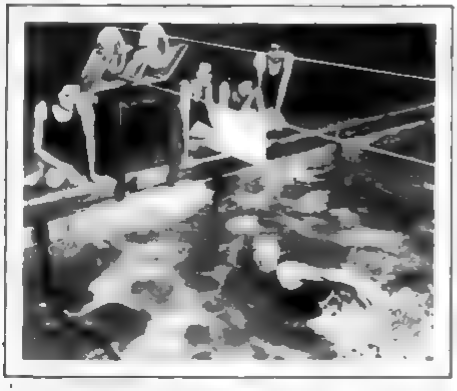
made land. Not all the buildings are temporary; the huge Field Museum, the Adler Planetarium, and the Shedd Aquarium are permanent structures which may almost be regarded as units of the Fair.

Perhaps the most unique of all the structures is the Railroad building, illustrated in the photograph on page 45. It is notable for its dome-roof—a huge expanse which is not supported by walls or pillars from below, but which hangs suspended from steel cables. This construction eliminates entirely all need of supports which would otherwise be required in the floor area, and enables the architects to take advantage of the largest unobstructed area ever enclosed by man beneath a roof. It represents the first important application to architecture of the principle of support used in the suspension bridge. The dome is 200 feet across and 125 feet above the floor. As will be gathered from a study of the photograph, the supporting cables have the appearance of a giant spider web.




Details of the "tree" lighting effect, in which trunk and branches of tree are represented by lights of alternating rose and blue shades as neon and mercury tubes are revolved on shaft. The diagram at right shows how this idea could be adapted easily to a Christmas tree decoration.

## Flag on Motor-Pulled Line Across Pool Sets Pace for Swim Champs



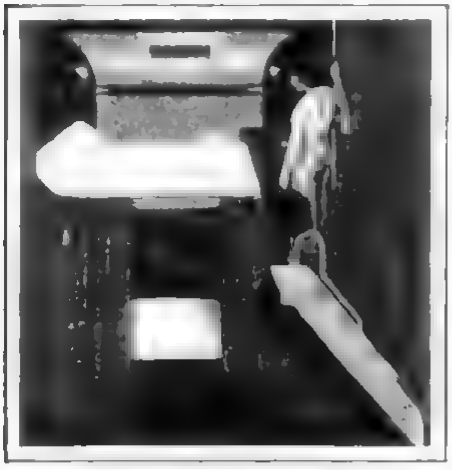
Helene Madison, swim champ, testing her speed with new automatic pacemaker. Flag is pulled across pool by motor.

HIGH speed swimmers have long been in need of some means of gauging accurately their speed as they cleave through the water, and now Coach Ray Daughters, of the Seattle, Washington, Athletic Club has come through with an ingenious contrivance which fills the bill.

The device, shown in the photo at the left, consists chiefly of a motor-pulled line stretched the length of the pool. On this line, which passes over a reel attached to a motor, there is hung a small flag, the idea being that the swimmer keeps pace with this marker as it traverses the pool.

One of the chief advantages of the contrivance is that the flag can be raced at almost any desired speed, thus enabling the swimmer to know precisely what clip he is hitting off. Miss Helene Madison, youthful aquatic marvel, is seen demonstrating the pacemaker in the photo.

# New Style "Upper" Has An Individual Folding Stairway



To retire in "upper," passenger walks up steps to built-in dressing platform. Hinged section folds back when ready.

NO LONGER will one have to be an acrobat to successfully retire in an upper berth of a Pullman car. The photo on the left shows the new style "upper." A stairway, which folds flat against the section when not in use, permits the occupant to ascend to the dressing platform without the aid of the porter.

This platform is 15¾" below the level of the mattress and allows 6½' free headroom. When the passenger is ready for bed he merely sits back, pulls up his feet, folds down hinged section of mattress and proceeds to "saw wood."

## Anti-crash Cockpit for Planes

ALBERT SAUVAN, noted French inventor, has developed a hydraulically equipped cockpit for airplanes which is practically indestructible. Shown below is the remains of his plane purposely destroyed to prove the invention.

With Sauvan seated at the controls, the plane was pushed off a 500-ft. precipice. It turned over six times in the fall and while the exterior casing was crushed, the interior cockpit remained intact and the inventor emerged from the wreckage slightly jarred, but unharmed. The invention may be compared in principle to the operation of an elevator that is hydraulically equipped to break its fall.

The plane's wings and propeller were removed before the fall since it was evident the plane would be wrecked in the test.

Pilot emerged unharmed from the shock absorbing cockpit of this plane which was pushed over a 500-foot cliff.

## Folding Piano Is Latest Style

A SMALL folding piano is just the thing for people living in small apartments. The photo below shows the piano in an "open" position with the keyboard dropped down from its recess, the music rack in place, and the top lifted.

When not in use, the keyboard folds up flush with the cabinet and the music rack folds back inside of the lid.

When folding piano is not in use, keyboard, which drops down out of recess, can be folded up flush with front of the cabinet. Music rack collapses and folds under lid.

## New Theory for Gas in Stomach

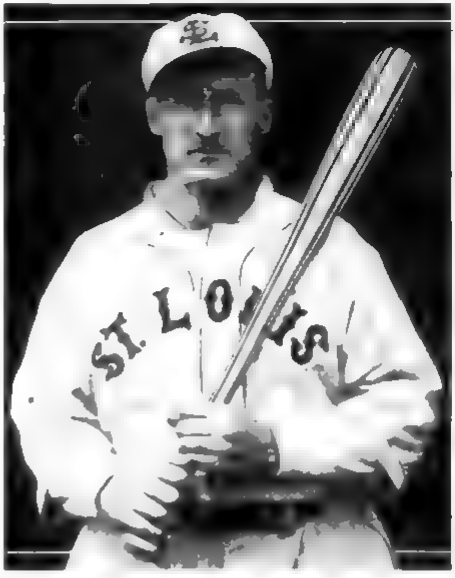
A NEW reason for gas in the stomach has been suggested by Dr. A. E. Russell of St. Thomas's Hospital, London. One cause often given by physicians for this digestive discomfort is the action of bacteria supposed to be living in the intestines and generating gases.

Dr. Russell believes that neither of these causes can explain the large amounts of gas which sometimes appear suddenly in the stomachs of sufferers from indigestion. The cause of this he believes to be the explosion in the stomach of what amounts to a Seidlitz powder, which fizzes violently and produces much carbon dioxide gas.

# Camouflaged Bat Bewilders the Pitcher, But Gets Banned

THERE'S an old saying about necessity being the mother of invention. "Goose" Goslin, outfielder for the St. Louis Browns, was having a hard time hitting that old "apple" during the spring training so he adopted a black and white striped bat, shown at the right, and proceeded to pound his way out of the slump.

This was the first time in baseball history that a camouflaged bat was used. It was designed by Willis Johnson, club secretary, who planned to equip other players with bats decorated with cross-rings, blocks and triangles until the "higher ups" declared the use of the bat illegal.




"Goose" Goslin, slugging fielder of the St. Louis Browns, shown with his camouflaged bat which was declared illegal.

## Paneled Window Ventilates Car

UNHEALTHY ventilation of closed cars, resulting from the draft currents which enter when windows are rolled down, is overcome by the invention of a paneled window installed as shown below.

Designed primarily for the left front window, the new arrangement consists of four vertically extending, swivel glass panels. These are arranged so that their rear edges swing outwardly causing the air to enter the car indirectly. These rear edges of the panels slightly overlap the front edges of the adjacent panel so that air is excluded when the panels are closed. All are operated synchronously by means of a lever.

Air enters the car indirectly through these four panels so that there are no unhealthful back drafts. Panels are operated synchronously by a lever and overlap when closed.

## Chromium Tableware Gains Favor

CHROMIUM plated tableware is rapidly growing in popularity in the United States. For many years chromium has been used in the production of chrome alloys and stainless steels, but because of its hardness its use for plating tableware was not attempted until the comparatively recent perfection of improved and economical methods of plating.

Chromium plated tableware possesses several distinctive features which appeal to the housewife. Its permanent lustre requires no polishing. It is stainless. The hardness of the metal makes it adaptable for use for knives, forks and flatware.

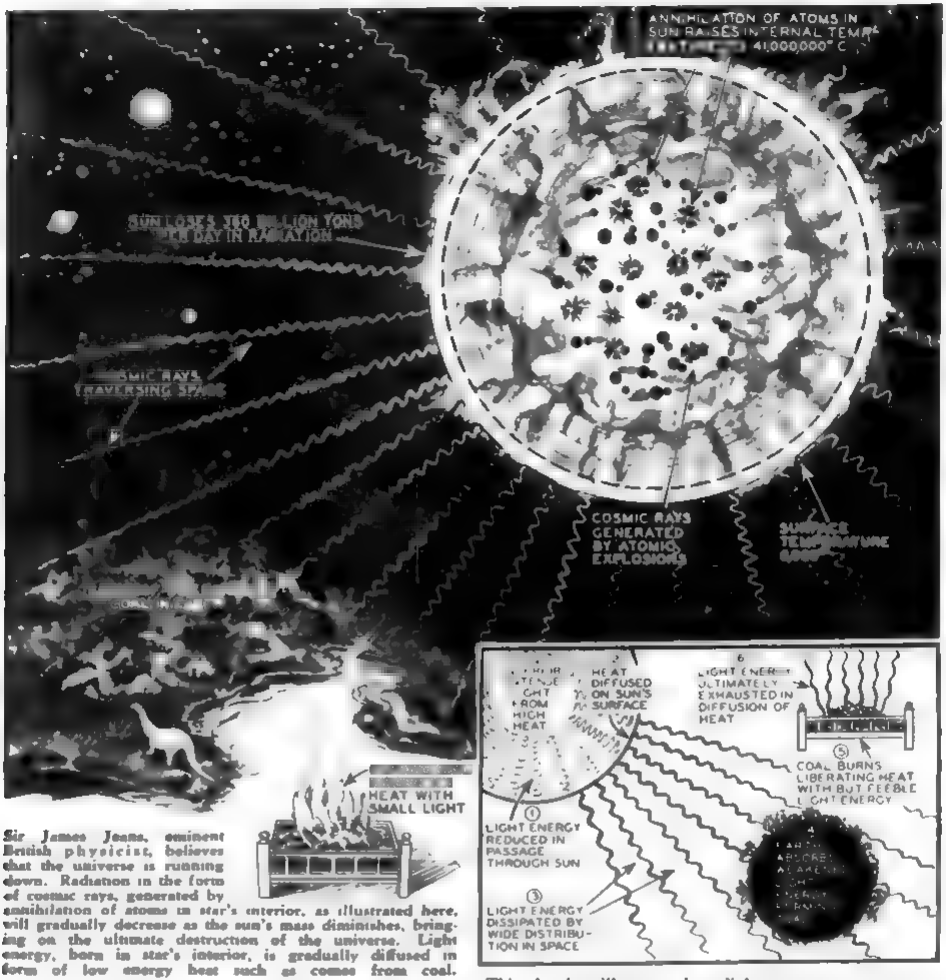
## Sodium Lamp Has High Efficiency

BURNING with an efficiency of seventy per cent, which is three to four times as efficient as Neon light, and giving six times as much light as a 40-watt Tungsten lamp for the same amount of current consumed, the hot cathode sodium vapor lamp, shown in the photo below, represents the most efficient light source yet discovered. It was invented by Dr. M. Pirani, of Berlin.

The increased efficiency of the sodium vapor lamp is due to the fact that practically all the radiation from the element, sodium, falls very nearly in that part of the spectrum which is most sensitive to the eye.

This lamp burns vaporized sodium with 70% efficiency and is the most economical light source yet discovered.

# *Fate of* UNIVERSE *May Be*




*Sir James Jeans, eminent British physicist, believes that the universe is running down. Radiation in the form of cosmic rays, generated by annihilation of atoms in star's interior, as illustrated here, will gradually decrease as the sun's mass diminishes, bringing on the ultimate destruction of the universe. Light energy, born in star's interior, is gradually diffused in form of low energy heat such as comes from coal.*

*This drawing illustrates how light energy, originating at sun's interior is gradually dissipated in the universe. End of world will come when all light energy has been exhausted.*

*by* **JAY EARLE MILLER**

**Where in the universe does the mysterious cosmic ray originate? Science is now conducting extensive research to solve that mystery, for the answer may disclose the destiny of the earth we live on.**

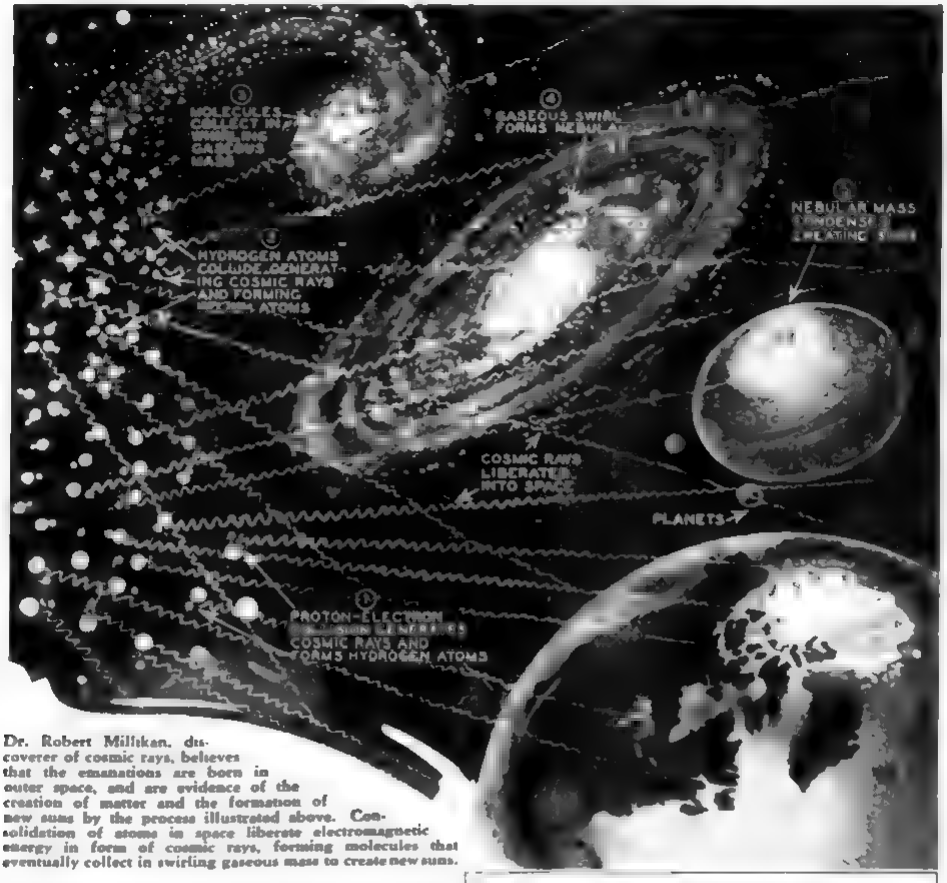
ON MOUNTAIN tops in Hawaii, Alaska, Peru and at other isolated points around the world—eighteen stations in all—an answer is being sought this summer to the most perplexing question in modern science—what is a cosmic ray?

First discovered nearly thirty years ago, and made famous in 1925 when Dr. Millikan of California Tech confirmed their existence, and, much to his embarrassment, the press named them "Millikan's rays," the cosmic emanation continues to be the baffling enigma on which scientists throughout the world are divided.

No one knows what they are, where they come from, or how they came into being, though all at last, as a result of Millikan's patient investigation, have agreed that they do exist.

Here is a ray, hundreds, probably thou-

# Told in Cosmic RAY Origin




Dr. Robert Millikan, discoverer of cosmic rays, believes that the emanations are born in outer space, and are evidence of the creation of matter and the formation of new suns by the process illustrated above. Consolidation of atoms in space liberate electromagnetic energy in form of cosmic rays, forming molecules that eventually collect in swirling gaseous mass to create new suns.

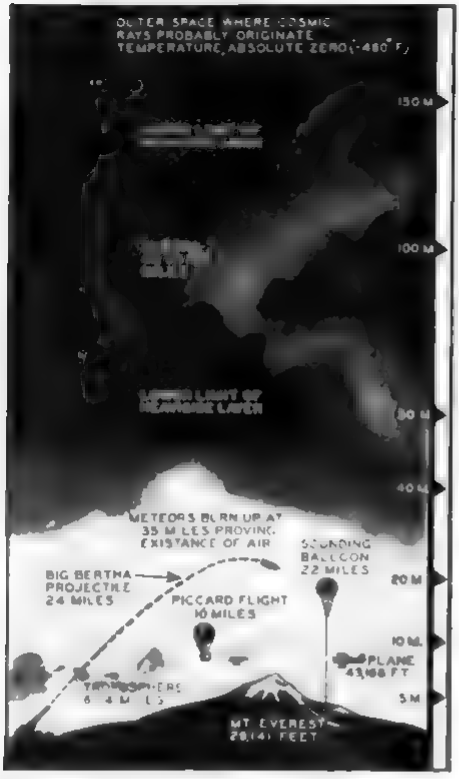
sands of times more powerful than the strongest X-rays or radium rays known. While a thin sheet of lead foil will protect the body or a photographic plate from X-rays, and a couple of inches of lead are sufficient protection against the penetration of the largest concentration of radium, the cosmic ray passes with ease through as much as eighteen feet of lead.

They are found hundreds of feet down beneath the surface in snow fed mountain lakes. Instruments sealed in a cake of ice in the middle of Lake Ontario have detected them. Instruments flown more than ten miles into the air attached to sounding balloons have brought back similar records. There seems to be no place within reach in the known world where they are not—and yet all the scientific brains of the world have been unable to find their source or tell exactly what they are.

Professor Arthur Holly Compton, of the

Prof. A. Compton, who is conducting cosmic ray research.

# *Mysterious Cosmic Rays May Originate in Spiral Nebula in Andromeda*




**This sectional view of the atmosphere shows probable point of origin of cosmic rays in outer space. Idea of immensity of space can be gained by comparison with altitude records already achieved by man in his conquest of the air.**

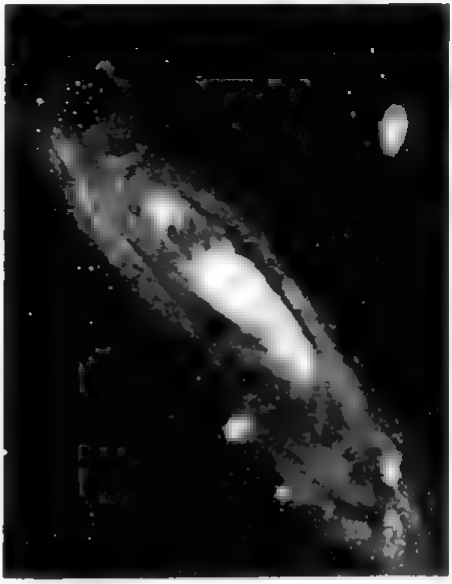
University of Chicago, noted winner of the Nobel prize for physics in 1927, is now on a tour of mountain tops in Hawaii, Alaska and the Andes repeating and checking the previous experiments of Dr. Millikan.

Other scientists in Europe are making similar tests to assist him, and when the results are compiled they may at least settle the first great argument between the followers of Kolhorster and Hoffman, in Germany, who maintain that the rays come from the particular portion of the heavens, and the Millikan school, which declares they do not.

### Nature of Rays Hotly Disputed

Even the nature of the rays is in dispute. Millikan maintains they are "hard" fast rays of the gamma sort given off in the disintegration of radium—their penetrating power being due to their "hardness"—super X-rays, in other words.

Bothe and Kolhorster, two of the greatest German investigators, on the other hand, claim they are fast corpuscles like electrons. Professor Compton, advancing a third view, suggests they may be protons or bullets of light.



**Prof. Kolhorster, of Germany, after extensive studies advanced the theory that cosmic rays originated in the great spiral nebula in Andromeda, shown above. His laboratory was a hollowed out cavity in the glacial ice in the Alps, where electroscope wouldn't be influenced by radium emanations.**

The great argument goes back to the early days of the century, when the newly discovered radium was the marvel of the world. Radium, in breaking down, gives off alpha, beta and gamma rays, and it was discovered they have the extraordinary property of ionizing or electrifying the air.

It followed then that the air must be electrified by all the radium bearing rock in the world, and, up until about 1911 physicists were satisfied that this could account for all the hitherto unexplained atmospheric electricity—that portion of it that was already known to be distinct from the purely static charge of thunderstorms and other natural phenomena.

### Rays Increase With Height

But if that were true, then the gamma rays of radium should be absorbed by the atmosphere, and the charge should decrease with altitude. But a Jesuit priest, Father Wulff, went up to the top of Eiffel tower and found that, while the effect was less than on the ground, it was not so much less as should be expected. And Prof. Gockel, a Swiss investigator, sent up sounding balloons with recording instruments, and discovered that, while the rays decreased at first, as the instruments went higher the rays increased again!

There was only one conclusion, after repeated trials had proven the report was correct: somewhere in outer space there was a cosmic ray producer constantly supplying the world with a new bombardment.

## *"Telescope" With Nitrogen-Filled Spheres Determines Source of Rays*

The theory did not fit in with known facts, and science, as a whole, remained unconvinced. One of the most unconvinced ones was Professor Millikan. He started an independent investigation aimed to clear up the point. From Kelly Field, Texas, he sent balloons ten miles high. He carried instruments and lead shields to the top of Pikes Peak, to the top of Mount Whitney, had records taken in the Hudson Bay country and far down near the magnetic south pole. He sent instruments to the bottom of Lake Arrowhead and Muir Lake, the latter 11,800 feet above sea level. And, in 1925, he announced that the rays were coming from outer space.

That had hardly been settled when Kolhorster hollowed out a laboratory in the glacial ice of the Jungfraujoch in the Alps and returned with word that the rays were coming from the neighborhood of the spiral nebulae in Andromeda and that they fluctuated slightly in a regular cycle.

Millikan, Compton, Prof. Regener, of Stuttgart, and others made new investigations. As a result most of them denied the directional claim. They found rays present in about equal amounts in every direction. The point, however, remains unsettled.

As this is being written Dr. W. F. G. Swann, director of the laboratory of the Bartol Research Foundation at Franklin Institute, is preparing to take a new measuring device to Pikes Peak to settle it. He has built two steel spheres, filled with nitrogen gas, with a lead cylinder for shield between them.

*(Continued on page 175)*

**Scientists disagree hotly on the source of the cosmic rays. Above at the left are illustrated the three probable sources, as advanced in the theories now prevailing. At right, above, shows the first cosmic ray telescope used to determine cosmic ray source. Right, below—Dr. W. F. G. Swann, prominent physicist, with his extremely sensitive electroscope which detects the presence of cosmic rays bombarding the earth from outer space and measures their intensity.**

# Gear Lever Knob Controls Engine Speed When Shifting

The speed of the motor is controlled by operating small knob on top of shift lever while changing gears. With this device, both feet are left free to manipulate pedals.

A HAND throttle attached to the gear-shift lever enabling the motorist to control the speed of his motor while shifting gears has been invented by John W. Coomler, of Venice, California. Besides saving time in driving through traffic, the device facilitates starting the car on a grade, and is especially useful when it is necessary to shift into a lower gear while descending a hill, both feet being free to operate clutch and brake.

The same knob, shown in the photo on the left, actuates the gear shift and throttle. A light piano wire passing down through a tube along the shift lever is connected to a simple mechanism which makes the hand control independent of the foot throttle.

## Wire Net on Boat "Scoops" Fish

ATTACHED to the front of a boat like a huge wire scoop, the recently-developed novel fishing net, shown below, catches fish while the fishermen merely guide their craft back and forth over the "grounds."

No baits are necessary, as the fish are caught when they swim up the runways on the side of the attachment and get trapped in the wire pockets. These are dropped down from the runway making it difficult for the fish to escape.

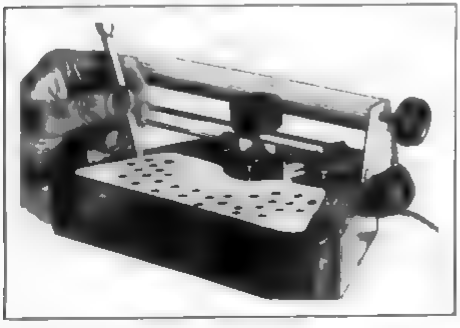
Fish swimming in front of the boat are caught in wire "shovel." As they move along the runway, they get into the pockets which are pulled up and emptied when full.

## Doctor Discovers New Anesthetic

THROUGH purification of divinyl oxide, Dr. C. D. Leake and associates at the University of California Medical School have developed a new general anaesthetic which, it is declared, acts more quickly than chloroform, ether and other gases.

## Electric Typewriter Has 20 Parts

GEORGES PALLATON, Swiss inventor, has designed an electric typewriter built from 20 parts, compared to approximately 2,000 used in the typewriters now on the market. The machine, shown below, has no keyboard or spacer, the advance and return of the carriage being electrically controlled by means of a small battery placed inside, or by an extension cord connection.



This midget typewriter has no keyboard or spacer, the advance and return of carriage being electrically controlled.

## Why Alcohol Makes the Nose Red

THE reason why people who drink too much alcohol so often have red noses is that habitual dosing with alcohol damages a small nerve center in the brain; the one that controls the constriction or relaxation of the small blood vessels. Its action in relaxing the blood vessels explains the flushed face and the pinkish color of the skin.

Constant use of alcohol causes these vessels to stay relaxed, especially those in the skin of the nose, and other parts of the face.

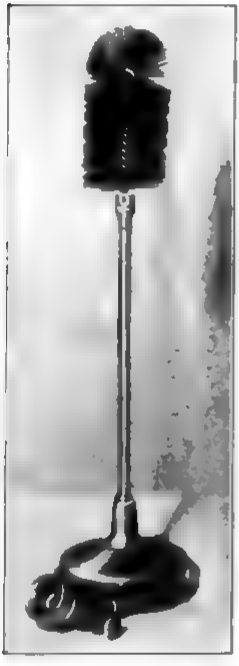
# Huge Reamer Is Latest Development in Oil Well Drilling

AMONG the newer developments in oil well machinery is the huge reamer, shown in the photo on the right, which was exhibited at the third annual Oil Equipment and Engineering Exposition held recently at Los Angeles.

The reamer, which looks like it might be some new type of spark plug, is made of hard steel and is used to re-bore the oil wells to accommodate larger casings. Reboring is done by revolving the three cutting cylinders on a shaft at a high speed. Cutters are set slanted on the triangular-shaped plug cast to hold the cylinders.

The 3 cylindrical cutters mounted in the corners of the triangular block do the cutting when this huge reamer is in use re-boring oil wells to accommodate larger casings.

## Bottle Washer Is Lawn Sprinkler



Bottle brush can be removed and water sprinkler attached.

THIS is the age of combination tools and appliances. The bottle washer shown in the photo on the left can be changed into a good lawn or garden sprinkler by removing the brush and fastening on a small ball attachment.

When used to wash bottles, the device is attached to the faucet and operated by pushing a button. This shoots a strong spray of water through the brush, revolving it rapidly.

If sprinkler is needed, the water motor in the base of the apparatus will send the water through the attachment, throwing a very fine spray 15 feet high over large radius.

## Bad Liquor Causes Liver Disease

A DANGEROUS liver disease accompanied by the deposit of iron compounds in the skin is believed to be caused by drinking liquor containing copper from the stills used by incompetent distillers.

Physicians have long recognized a condition called hemochromatosis in which the cells of the liver are killed or damaged; resulting, among other things, in the partial destruction of the red corpuscles. The red iron compound of these corpuscles is then changed chemically into other compounds which may be deposited in the skin, turning it bronze in color.

## Cellophane Blanket for Sun Tans

CALIFORNIA sun bathers are now getting their tans "wrapped in cellophane." A specially dyed cellophane blanket, shown in use in the photo below, prevents the sun from burning or blistering the skin, but allows the ultra-violet rays to give it a healthy tan. The new "tanner" is large enough to cover the body, and when carried may be rolled up into a small cylindrical bundle.

This specially dyed cellophane blanket prevents the sun from blistering or burning the bather, but allows ultra-violet rays to pass through to give skin a healthful tan.

# Mountain Climbing—Sport

The mountaineer's axe, similar to a pick, is an indispensable piece of equipment. Here a mountain climber in the Canadian Rockies is shown testing a foothold with the axe handle.

The leader here is shinnying his way up a crevice, known to mountaineers as a deep chimney, while his companion is giving him slack in the rope.

**Mountain climbing, like all sports, demands courage and skill of its devotees, but unlike milder forms of recreation, it exacts grim penalties of death or maiming from those who fail at it. Some mountains—notably Mt. Everest, king of them all—have resisted to this day the puny efforts of men to scale them. But some day Everest will be climbed, by men using methods described here.**

IF YOU have a tendency to dizziness when leaning out a fifty-story window, if hanging by one hand from the Brooklyn Bridge gives you an uneasy sensation in the stomach, if you confess to a feeling of nervousness at the idea of walking about on top of the dirigible *Akron* when she's five thousand feet in the air, and if you wouldn't relish the prospect of dangling at the end of a rope with nothing beneath you but sharp-toothed rocks half a mile below—don't take up mountain climbing as an avocation, for the simple reason that this sport of sports requires all the virtues hinted at above, and a few dozen more.

But, if you're seeking a stout-hearted sport, and are intrigued by dangers rather than discouraged by them, mountaineering is your "meat."

One reason why mountain climbers are roped together—a slip on the side of this ice cliff would send the climber to his death were he not fastened to his companions.

Barring the rash and reckless attempts of novices, deceived because of inexperience by the mute dangers which lurk on the faces of rocky or snow-capped slopes, mountain-climbing has become a pastime which has thousands of devotees. The rosters of organizations such as the Himalaya Club, the Alpine Club, the British Alpine Club and scores of others, which include the names of leading scientific, literary and professional men bear testimony to the popularity of snow and rock-craft.

# for STOUT HEARTS

by BEN LINCOLN

The joy of conquering what seem at first glance unassailable heights of rock and ice is not an exclusively modern pleasure. As long ago as 1492 the whimsical King Charles VIII ordered the first ascent of Mount Aiguille, near Grenoble, so the sport has a history dating back to Columbus—and no doubt the cave men had some sort of mountain climbing guild to seek out new homes for themselves.

In 1857 the Alpine Club was organized and then came a series of assaults on the Alpine giants. They were all conquered in quick succession.

With the scaling of Mount McKinley in Alaska, whose height of 20,300 feet makes it the highest on the North American continent, and with the subjugation of European peaks, the attention of the hardy and experienced mountain-climber—many men having taken up that calling as their professional life work—has been fixed longingly on the Asiatic crests, particularly the Himalayan.

### Everest Still Defies Man

Of this group, Mount Everest is sovereign, rising 29,141 feet. Through the years it has successfully defied the onslaughts of the intrepid soldiers of fortune who have stormed its barriers. Its sister peak, Kanchenjunga, 28,225 feet, has also resisted the charge of daring adventurers.

But Kamet, 25,447 feet, in the same locale, was conquered last June by an expedition which failed to topple Kanchenjunga.

The besiegers of Mount Everest have been handicapped by avalanches, blizzards and atmospheric conditions at high altitudes. The last elaborate and valiant attack on Mount Everest was made in June, 1924. It was a British expedition.

The plan of the climbers was to establish camps along the line of elevation. As one camp was set up at a 2,000-foot interval, two or three of the men would advance a similar distance to establish a like outpost. Native porters were employed to carry the implements and supplies.

### Victory For the Mountain

On June 7, two of the crack climbers in the company, veterans of previous attempts to subdue the heights of Everest, set out from Camp Six, the topmost point reached by the expedition. They proceeded in the direction of the summit. They were George Leigh Mallory and A. C. Irvine.

Camp Six was at 27,000 feet and it was known that Mallory and Irvine had consumed the minimum amount of their oxygen supply in attaining that position. From this station they were seen like a pair of tiny silhouettes moving somberly toward the summit.

Suddenly the vision of the two dim figures vanished. They disappeared into the eternity which Mount Everest has dealt to all others who have come too close to her majesty, untouched glory.

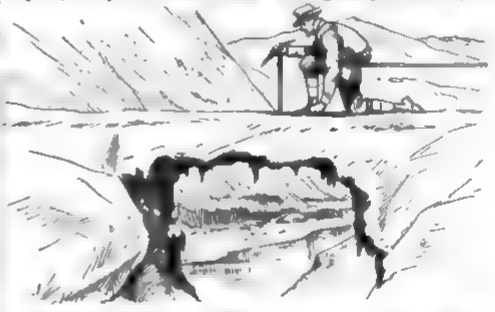
When the fate of Mallory and Irvine became apparent, the expedition retreated and abandoned its purpose until means

Photo at left above shows how rope is used to "lasso" projecting rocks which are used by climbers to pull themselves up, as further illustrated in the drawing. At right is shown a breath-taking ascent of an Alpine rock pinnacle.

# *Rope, Axe, Boots, Sun Goggles, Compass Needed Equipment of Climbers*

Recommended equipment for the mountain climber is shown in this photo of guide and woman mountaineer in the Canadian Rockies. The manila rope is knotted around the waist and is long enough for plenty of slack. Mountain axe, light pack, heavy shoes and durable clothing complete the layout.

This is the way in which mountaineers climb sheer surfaces which offer no possibility of a hand or toe hold. Need for stout shoes and sturdy costumes is explained by the photo.



Caution must be exercised in crossing a snow-bridged crevasse. Leader advances on one knee, testing solidity of ice with his axe. Rope around his waist is held taut by his companions so he can not drop far if the ice collapses.

were developed for coping with nature's weapons in the upper strata.

Hardly ever has there been a mountain-climbing sortie without some display of heroism, the making of sacrifices for a fellow-climber. The elemental nature of man becomes vividly exposed as hardships are faced during crucial stages in the riskier phases of mountain-climbing. A feeling of comradeship persists which cannot be paralleled, certainly not surpassed, by men who have found themselves in other perils.

Professional mountain-climbers stand divided on the efficiency and aid of oxygen at great heights. It has been recorded that at an elevation of over 10,000 feet some climbers have not been able to advance over ten feet an hour when they were without a supply of oxygen.

Some mountaineers maintain that a climber should become acclimated by living at a high point for several months and that then he might advance without difficulty. Kamet was conquered last June without the aid of an oxygen supply. It marked the highest summit ever attained by man. The expedition was led by Frank S. Smythe, illustrious British mountaineer.

The outfit of a mountain-climber is simple. Naturally, it must not be cumbersome. A map and a compass are essential as well as the ability to use both.

Most climbers use the Alpine rope, which is a Manila cord, from 60 to 80 feet long.

This is regarded as thoroughly reliable. The mountaineer has special boots, adaptable to the region to be explored. The nails in them are of considerable help in climbing and scaling. The alpenstock pike is used for less arduous climbing.

The best axe obtainable for this sport should be sought. One with a shaft of straight-grained ash is the generally accepted type. When it comes to rope and axe, some one who has had experience in their selection and use should be consulted.

The rest of the equipment, most of which will fit snugly into a knapsack of medium size, consists of goggles, field glasses, a cup, knife, searchlight and sundry medical items, such as bandages, boracic powder, adhesive tape and raisins. A small supply of the latter will go a long way in relieving fatigue after undergoing some of the taxing rigors of climbing.

Nerve and the pink of condition are indispensable partners for the mountain-climber. It is the sport of rugged men and brave women. Its potential dangers exclude the weak from its pleasures.

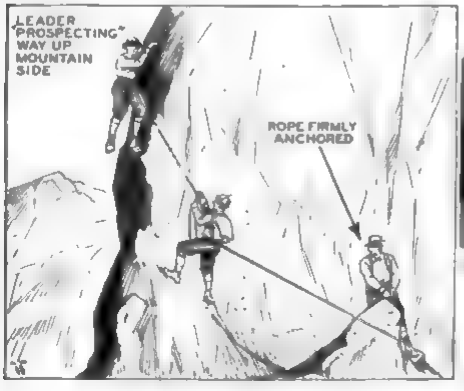
The ideal mountain-climber is, of course, an athlete. He, or she, is alert, quick-thinking and ingenious. Sometimes it's mighty hard work too. Step-cutting with the axe up the side of a slope means advancing about 100 feet an hour as a rule.

The climber must be able to recognize the possibility of an avalanche, the existence of crevasses on glaciers and the rigidity of a snow bridge. He must also safeguard against the dazzling snowfields which cause blindness. If he has mastered these points he is an adept in snowcraft.

The average mountaineer, indulging for sport, need not be concerned about lugging oxygen tanks along. If he happens to have a pulse-beat which is below normal at sea-level, say around 60 beats to the minute, he is better qualified for mounting the high altitudes.

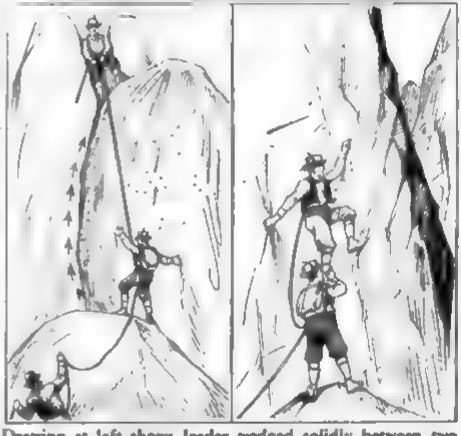
Moment of moments for the mountain climber—the topmost peak attained! But getting down is sometimes more difficult than climbing up.

A common trick among mountaineers is to wedge a rock into a crack, using it as a rope hold.




Three is the favored number for anchoring to one rope. In photo above, the leader is helping up the middleman, while the third climber waits his turn, keeping alert to act in case of danger. At left, drawing shows how rope is anchored around a rock while the leader feels his way carefully up a particularly perilous mountain wall.

Glaciers are treacherous but fascinating challengers to the mountain climber. Crevasses like this one in an Alaskan glacier abound, and extend down for unfathomed distances. No wonder the tourists are careful to tie themselves securely to the common rope.



Drawing at left shows leader wedged solidly between two rocks, where he can exert all his strength to help second climber along the path shown by arrows. At right, leader climbs upward from companion's shoulder. Companion faces rock and offers no advice on available handholds—the leader is the acknowledged expert, and there's no "back seat driving" among the fraternity of mountain climbers.

At an elevation of 10,000 feet his pulse will tick off from 70 to 75 beats, while a normal pulse will rise to 90 to 95.

Three is the ideal number for binding with a rope. The principle involved is that of co-operation. While one or two of the climbers on the rope are anchored safely, the third person advances. If one of them slips, the other two should be able to prevent him from meeting with any misfortune.

The uses to which the rope can be put are numerous. The crafty climber can readily apply his skill as opportunities or emergencies arise. In rock climbing, the rope can be used by an expert to lasso an abutment or boulder, and then climb to that point.

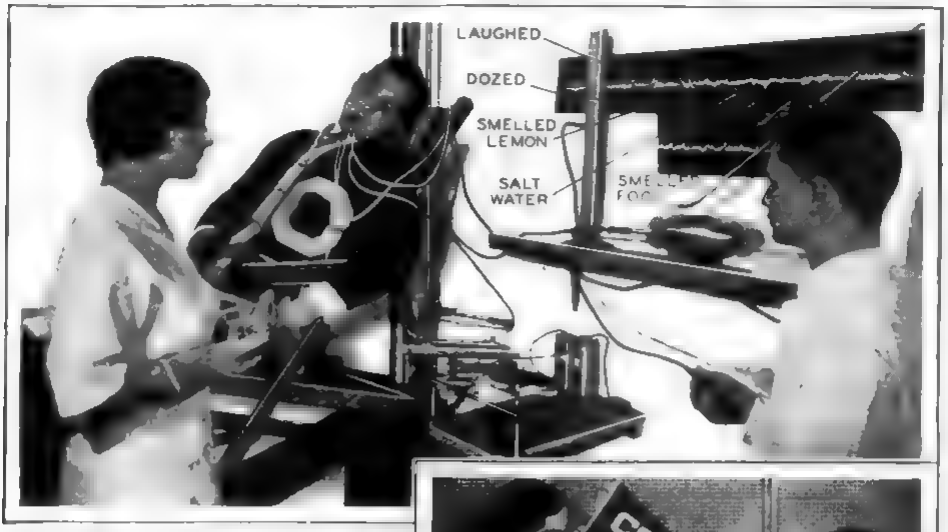
In reckoning with the fitness of a rock-climber, one thinks of his strength and stamina, his delicate sense of balance and his cool-headedness. All of these come into play in his hand and footholds. One false grip may mean oblivion, for him and his comrades.

Most feared of all mountain hazards, probably, is the avalanche, which comes without warning, sweeping everything before it in a swirling mass of snow and ice traveling at breakneck speed down precipitous inclines. A mountaineer is utterly helpless when he finds himself in the path of an avalanche.

Yet even here the experienced mountain climber has means of avoiding death under the snow. He knows that avalanches occur most frequently at certain times of the year, when snows start to melt, or when, after particularly heavy storms, unusually heavy masses are piled up on the mountainsides. He knows, too, that avalanches rarely start on slopes of a 60 degree angle or greater.

There is no primer for the mountain-climber. The fundamental essentials and qualifications have been dealt with in this article. To the sturdy adventurer in quest of excitement it offers unlimited thrills, surprises and defiance. Some day some one is going to vanquish Everest. There are stout hearts in mountain-climbing clubs who are threatening to do it.

# Science Shows NOISE Causes Indigestion




In conducting the experiment to ascertain the effects of noises on the digestive secretions, the subjects submitted to having a tube placed in their stomachs so that the flow of gastric juice could be checked when noises, ranging from whispers to the din heard in the noisiest section of New York City, were applied. It was found that the flow of the juice was impeded directly as to the amount of the noise. The glass apparatus, shown on the wall in the above photo, was used to make the measurements of the frequency and strength of the stomach contractions. Right—the test revealed that smell alone will stimulate or impede the muscular activity of the various digestive organs, a personal resistance.

In this test as noise from the loud speaker was increased, it was found that the secretion of saliva was decreased. Under influence of excessive noise the flow was stopped almost entirely. Action became normal when noise ceased.

WORKING with various intricate devices that record the effects of sound waves on the digestive processes, scientists have found that a lot of digestive troubles are directly attributable to noises. Dr. Donald A. Laird, of Colgate University, has discovered the effects of various noises on the digestive juices.

Using two different methods on a chosen group of healthy men, the experimenter measured the effect of discordant sounds upon the flow of saliva. It was immediately evident that many sounds had a distinct effect. For example, when the sounds increased in volume comparable to the noises in a quick lunch restaurant, the secretion of saliva decreased to almost half of the normal quantity.

When the noise increased still more and became as loud as din heard at Fifth Avenue and Forty-Second Street, in New York City, the flow of saliva almost stopped.

### Gastric Juice Flow Affected by Noises

The scientist and his associates went a step further in their measurements. Using tubes that reached down to the stomach, they had the subjects take a meal test and then watched the flow of gastric juice. Practically without exception, din, uproar and racket had a marked ill effect. As the noise increased, the gastric juice flowed less freely, preventing proper digestive action. The subjects showed all the effects of suffering from lowered stomach secretion when eating was accompanied by excessive noises.

In both instances, when the noise ceased the digestive juices began to flow normally.

# Serving Tray Rests on Table or Stands on Its Own Feet

By pressing a small button, serving tray is changed from the conventional type, shown in lower photo, to a handy four-legged table. Legs fold up under tray when handling.

WHEN entertaining in a small apartment or in crowded quarters the novel serving tray shown at the left will be found a mighty convenient fixture. It can be either set down on a table or made to "stand on its own legs."

If no table space is available when the maid brings in the tray, she has merely to press a small button and the four folding legs drop down. When removing, legs are folded back under the tray.

## Bromine May Be Cause of Sleep

A NEW gland chemical perhaps responsible for the long-standing mystery of sleep has been discovered by a German physiologist. The essential element of the new substance is bromine, an element not previously known to be important in the human body.

From researches on the exact amount of bromine in the blood or in body organs, it was found that this element is essential to the body and that at least one complicated chemical compound containing bromine exists both in the blood and in the adrenal glands.

The amount of this compound differs when a person is awake or asleep, and when set free in the blood in an unusual amount, it may be the cause of sleep.

## Aluminum Caps for Milk Bottles

MAXIMUM protection against contamination is offered by the new milk bottle cap shown on the right, which was recently introduced by a Denver, Colo., creamery.

It is cut from a sterilized strip of aluminum foil and fits snugly over the top of the bottle, covering that part of container which touches the liquid when pouring.

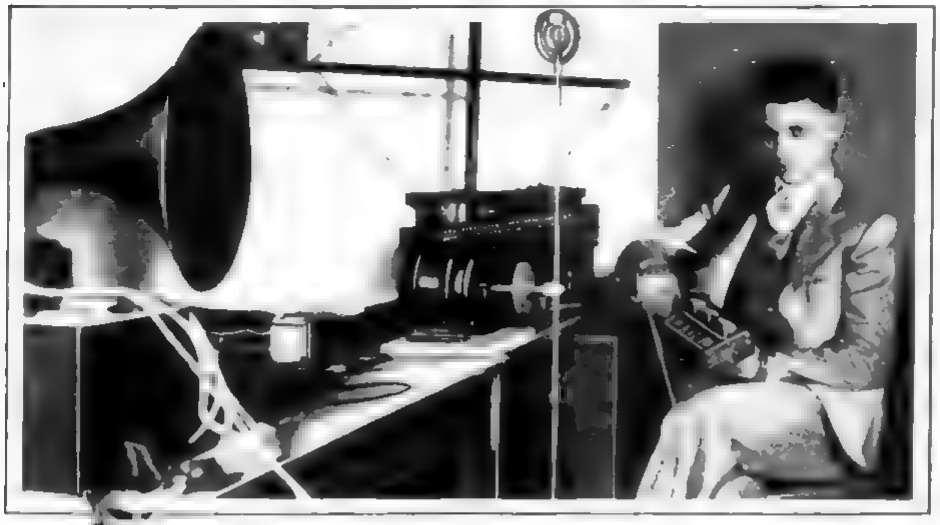
Aluminum cap prevents bottle from contaminating the milk.

## Portable Exerciser Weighs 1 lb.

BESIDES building muscles, the exerciser shown below claims recognition by the facts that it is extremely portable and weighs but one pound. The exercising unit, which has a T-shaped handle, is made of ¾-inch rubber. This is connected to a crossbar equipped with leather foot stirrups which are provided with a short strap and buckle, for adjustment.

Weighing but one pound, this portable exerciser is made of ¾-inch rubber and has leather stirrups for the feet.

# Tubeless Receiver May Revolutionize Radio



Ernest Patrick, youthful inventor of tubeless radio in the laboratory in which he worked for five years to perfect his instrument. Set employs condensers of type he is holding.

Dr. Bruce Morgan, noted British physicist, is shown inspecting the tubeless radio recently perfected by Ernest Patrick.

PROMISING to open a new era in the art of broadcast reception, a new tubeless radio has been perfected which engineering experts claim will revolutionize the radio industry throughout.

No details of the outfit's construction are available as its inventor, Ernest Patrick, 21-year-old Indiana youth, is keeping the operating principles of his creation a closely guarded secret.

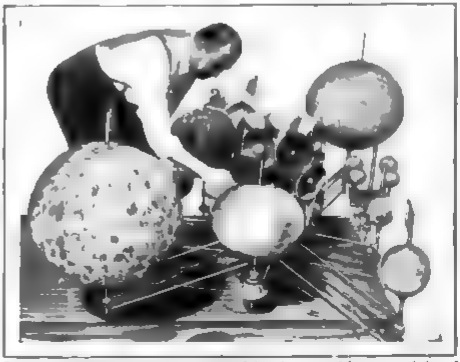
Dimensions of the set, which is shown in the accompanying photo, and which, it is claimed, employs no tubes whatever, is 12 inches high and 6 inches wide. Using the set all programs are brought in instantly at a touch of the dial, with a minimum of static, interference and fading.

## Amazing Model of Solar System Built to Illustrate New Tide Theory

SCIENTISTS have long held that the moon was responsible for the terrestrial tides, but Jordan Peeler, a Los Angeles astronomer, disagrees. To prove his case he has constructed a most unusual working model of the solar system. Although built on a somewhat exaggerated scale the model will be employed for purposes of clarification in lectures Mr. Peeler is to give.

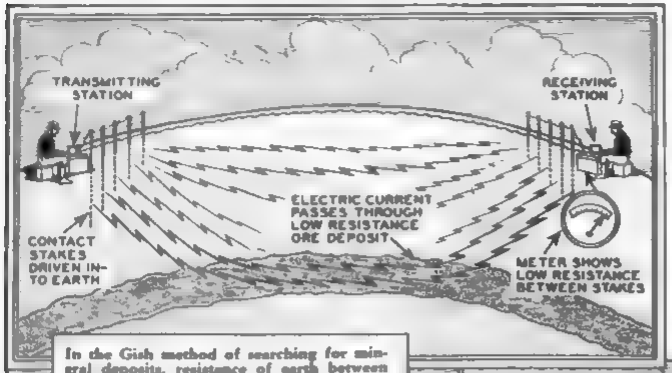
Shown in the photo at the right, the model is a marvel of compactness and intricacy. With the various planets close together, their orbital movements are illustrated with graphic reality, the course of the ethereal bodies being synchronized by a special mechanism to rotate just as their prototypes do in the sky overhead.

$10,000 and 14 years of effort went into the construction of the mechanism.

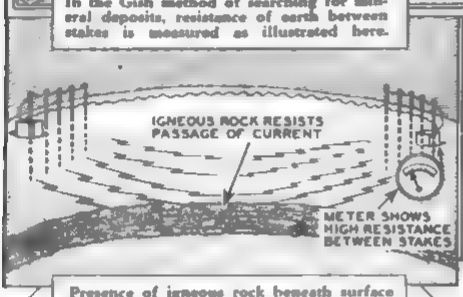


Jordan Peeler, astronomer, with the working model of solar system which he built to illustrate new theory of tides.

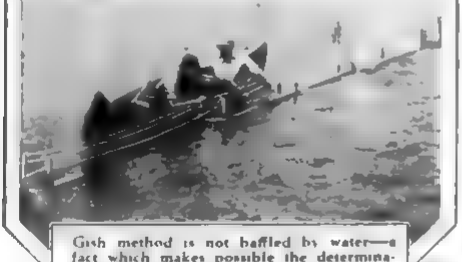
# Science "X-RAYS" the Earth




In the Gish method of searching for mineral deposits, resistance of earth between stakes is measured as illustrated here.



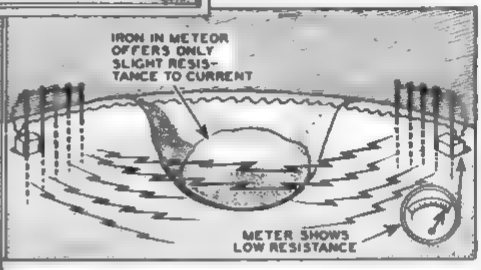

Presence of igneous rock beneath surface is indicated by low reading on meter. Rock sets up high resistance to current.



Gish method is not baffled by water—a fact which makes possible the determination of sediment depth at dam bottom.

Scientist here is shown at work in the field measuring currents shot through Mother Earth with the Gish "X-ray" apparatus. Note the stakes driven into the ground to make contact with the earth. On the portable field cabinet is mounted the meter which registers the current passing through the earth, thus indicating the presence of high resistance rock or low resistance ore beneath the surface.

**Old Mother Earth has long managed to keep the secrets of her treasures in minerals and oils a closely guarded secret, but she cannot now hold out against the devices which scientists have perfected to probe to extreme depths.**




Investigating a meteor crater scientists were able to determine the character of the buried planetary fragment as illustrated here. It was found that the meteor was composed largely of iron, scattered in pieces about the crater.

*by* **JOHN L. COONTZ**

WILL Science succeed in its present sensational plan to X-ray Mother Earth 100 miles beneath her surface in search of mineral secrets which may mean fabulous wealth?

Maybe not. But a youthful scientist of the terrestrial magnetism department of the Carnegie Institution of Washington has reason to think so. He has just developed, patented and tested to his own satisfaction an entirely new kind of apparatus which probes the hidden depths of the earth by passing an electric current through even the mightiest rocks.

### "X-Ray" Has Uncanny Accuracy

For more than eight years this young scientist, Oliver H. Gish, by name, has been painstakingly perfecting his new instrument. It consists, he says, of an ammeter and a potentiometer of standard type, switches and other electrical devices, some of special design, all connected with a particular kind of circuit.

With almost uncanny accuracy this electrical divining rod determines the very nature of hidden earth material, measuring its depth, character and relationship to other subterranean features.

# to Locate RICHES in ORE

What makes Mr. Gish's "X-Ray" device of special importance to the world is the fact that the patent for the unique apparatus, though assigned to the Carnegie Institution, has been dedicated to public use.

Already scores of private commercial organizations in this country and abroad have been supplied with blueprints and working drawings of the new instrument and given permission to construct and use it. Many exploring companies are now planning to use this revolutionary type of ore-finder in prospecting for various minerals.

### Mr. Gish Explains His Apparatus

"In general," Mr. Gish explains, "the apparatus serves the commercial geologist in much the same way that the X-ray serves the physician, surgeon and dentist.

"Expressed in simple terms, my apparatus operates by sending a measured electric current through a portion of the earth by means of wires which connect with the earth at two points on the surface.

"At the same time the electrical effect (voltage) set up by this current between two other selected points on the surface can be measured accurately. From data thus gathered it is possible to calculate that electrical property of the earth known as its specific resistance to the flow of electricity.

### Ore Detected by Its Electrical Resistance

"Different minerals, we know, vary widely in this resistance to electric flow. Igneous rock, such as granite, gabbro and trap have an electrical resistance many thousand times higher than most other ore deposits. It is this contrast that makes possible use of the new device for prospecting and exploring the interior of Mother Earth.

"Already the new device has proved its worth as an important aid to the commercial geologist. Widespread exploration for petroleum has been carried on with it in the western Texas oil fields. Depths of more than a mile have been reached with its sensitive feelers. This was in southern California during a survey of a large underground oil pool.

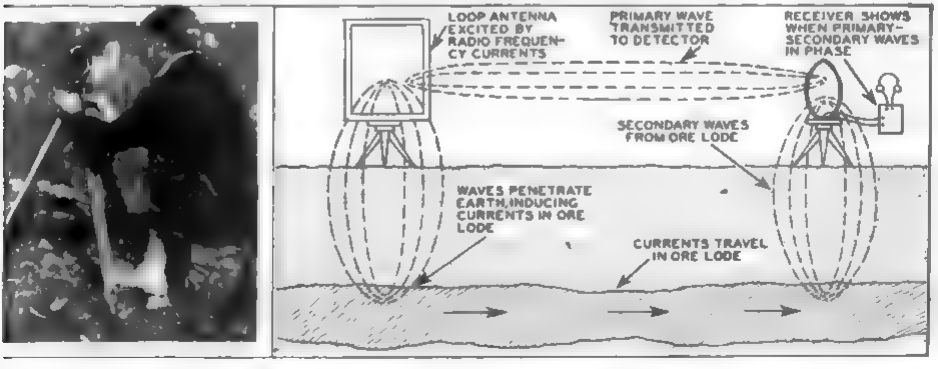
"Another outstanding device, this time strictly scientific, was the recent investigation of Meteor Crater, a mysterious natural phenomenon located in Arizona.

### X-Ray Tells Metals in Meteor

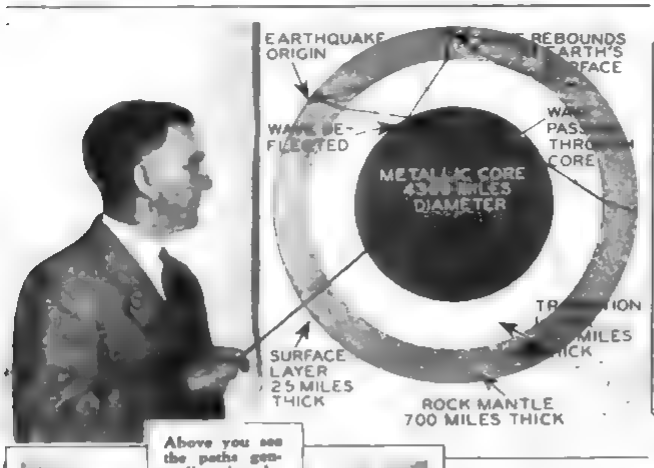
"Ages ago this crater was formed by what is believed to have been a giant meteor hurtling through the air from outer space and burying itself thousands of feet below the surface. In order to determine the character of this buried planetary fragment the 'X-ray' was set up in and around the crater and electrical currents sent down through the earth to the hidden substance below.

"Quickly the apparatus revealed the hidden secrets of the visitor from the outer world and its character. There was no great body of meteoric iron beneath the crater's floor, it divulged, but there were a consid-

Here a geologist is shown manipulating the radio loop in search of underground deposits of ore and oil.

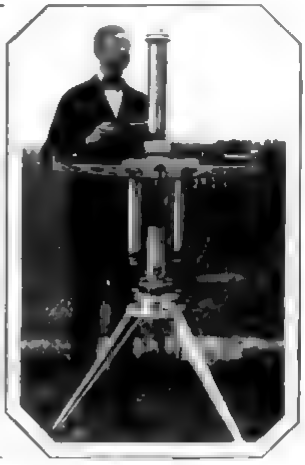



Left, above—Scientists detect ore-bearing minerals by use of this superdip, which has compass-like needles to indicate earth's magnetic differences. Right—In "X-raying" earth by radio, electromagnetic waves are broadcast from loop antenna, which induces currents in ore-bearing vein. Primary and secondary waves are brought in phase to locate vein.




Above you see the paths generally taken by earthquake waves from point of origin.

Employing this special type of seismograph scientists determine the course of earthquake waves passing clear through the earth as illustrated in the photo at top of page. Wavy line indicates disturbance has passed only through the crust, while a straight line, through center of earth.



By means of the gravity instrument, shown at right above, which measures the differences in earth's gravity pull, geologists are able to locate salt deposits beneath the earth. Salt domes, it is found, usually lie close to oil deposits.

erable number of scattered small pieces underlying the southern portion of this floor.

"The particular scientific work for which the apparatus was designed and constructed is part of a broad study of the natural electric currents which flow in the earth's crust. These so-called earth-currents are related to changes in the earth's magnetism and to the northern, or polar, lights. They seem also to be affected by the same factor that influences the strength of radio broadcasts which reach our radio sets. The nature of these relationships is not yet well understood."

### Radio Waves Locate Ore Deposits

Science in recent years has developed several outstanding methods of "X-raying" Mother Earth. Among these is the radio method. In this method radio waves are broadcast from a certain point on the earth and the character and strength of the waves are determined at another point which is being explored. This information discloses the presence of hidden ore bodies which conduct electricity.

One disadvantage this method has in underground exploration work is the limited penetrating power of the radio waves. Their greatest earth-penetrating depth, so far ascertained, has not been over 500 feet and 50 feet seems to be the limit of their penetrating power in sea water. It is obvious from this, therefore, that the moisture content of the soil stands in the way of this method ever becoming effective at great depths.

Another method of probing the hidden depths of the earth is the seismograph of ordinary earthquake association. This instrument detects differences in the density of the earth's crust. By means of this device we know that there is a difference in the density of the outer or crustal part of the earth and its center or core. It further reveals the core to be a ball, presumably of iron, about 4,300 miles in diameter.

### Minerals Found by Their Gravity Pull

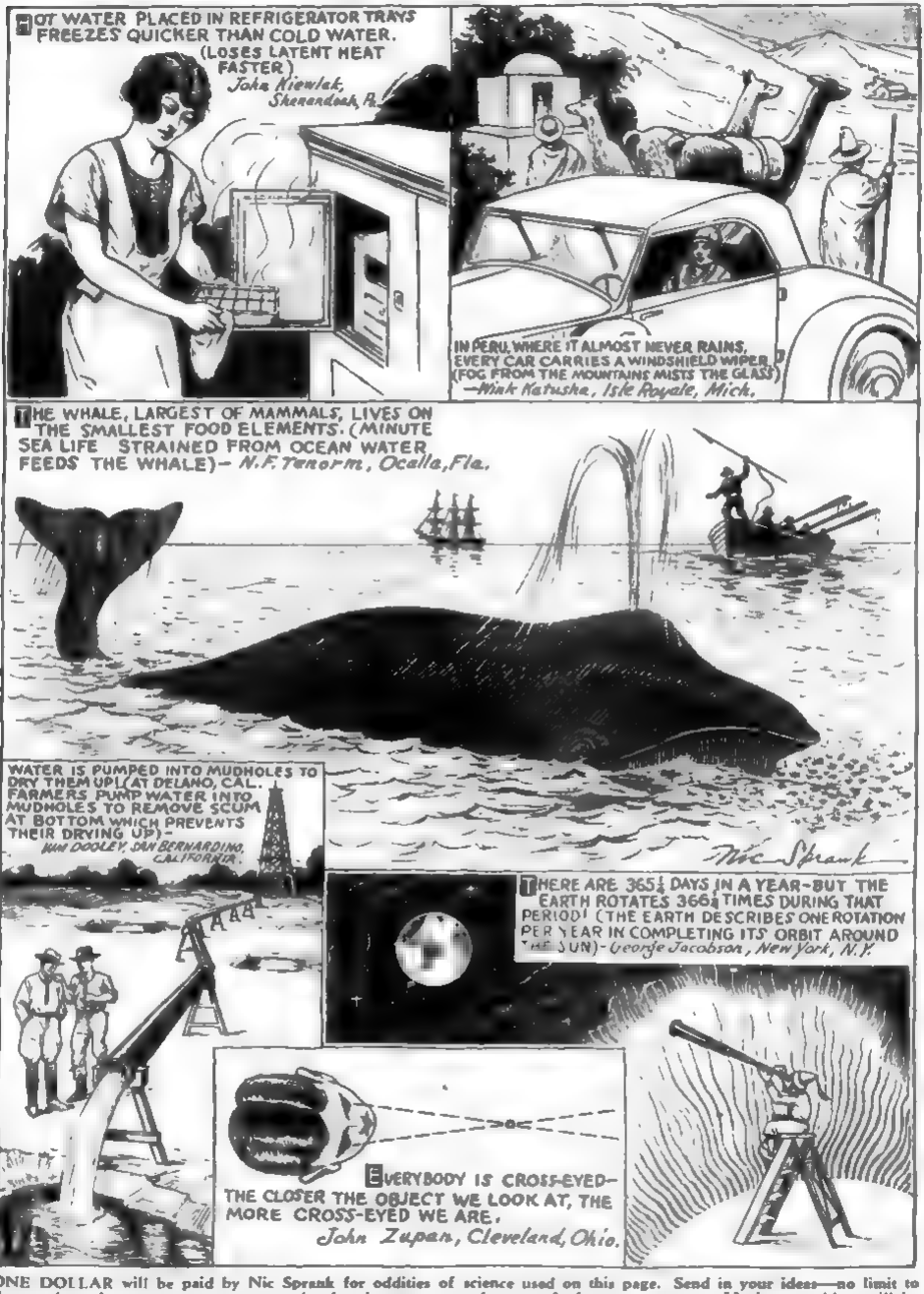
A third method of getting "inside information" about Mother Earth is the gravity method. In this method the differences in the earth's attractions or gravity pull are measured. From these measurements the geologist is able to draw conclusions as to the presence of certain types of minerals below the earth's surface.

A fourth method of underground exploration is the magnetic method. Here the differences in the earth's magnetic force are measured. These differences reveal to the mining engineer the presence of structures underground usually associated with oil.

But none of these methods give any information about that great belt of earth that lies between the bottom of the deepest bored oil well and the great inner ball of our globe, said by scientists to be from 60 to 100 miles in thickness. The seismograph only records quake waves or vibrations passing through this belt.

# Oddities of SCIENCE

by NIC SPRANK




**ONE DOLLAR** will be paid by Nic Sprank for oddities of science used on this page. Send in your ideas—no limit to the number of suggestions you may make, but be sure to enclose proof of your statements. Maybe your ideas will be better than those shown on this page—if they are, Nic Sprank wants them and will be glad to send you a check. Address suggestions to Nic Sprank, care of Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.

# Midget 2-Cylinder Gas Motor Powers Model Speed Boat

The model speed boat above is powered by a specially built midget 2-cylinder gas engine which turns up to 5000 r.p.m.

ENGINE trouble doesn't bother the owner of the model speed boat shown on the left. When anything goes wrong, he merely unfastens a few bolts, lifts the motor out and holds it in one hand while he checks up on all the parts.

The model is 44″ long, 7″ deep, has a 10″ beam, and was designed after the "Hacker-Craft." Thin mahogany was used for the sides and the bottom made by hollowing out a pine block.

A specially-built 2-cylinder gasoline motor which turns up 5,000 r.p.m. powers the craft. The over all dimensions of this midget motor are: length, 7¼″; width, 4″; height, 6½″. Flashlight batteries are used for the ignition and the spark plugs were obtained from an outboard motor.

## A Few Rules for Safer Washdays

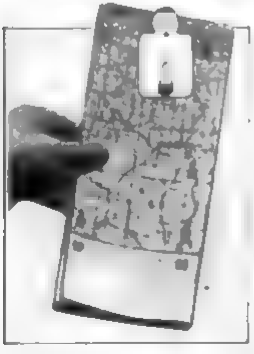
STATISTICS show that about 30 accidents occur every week in the apparently harmless occupation of doing the family washing. Here are a few suggested precautions which, if followed, will decrease the possibility of such injuries in your home.

Don't wear any torn garments or loose-fitting apparel, such as belts or ties, which might catch in the machinery or wringer. The danger from shock can be decreased by never touching an electric switch or fixture with wet hands or while standing on a wet floor. Keep small babies out of the room.

## Phonograph Used to Call Ducks

HERE is a novel idea for coaxing wild ducks toward your blind next fall. The plan is to capture a number of wild ducks alive and instead of putting them out as decoys, simply make a record of their quacking and play it on a portable.

## Utility Hanger for Your Car



The road map is slipped into hanger, which fastens on window.

HATS, road maps, and other articles are held in a handy place in your car by the new gadget shown in the accompanying photo.

It consists of a flat steel plate having two hook-like projections, one in the form of rubber-cushioned spring. It can be mounted on any flat surface.

## Emergency Life Belts on Bridges

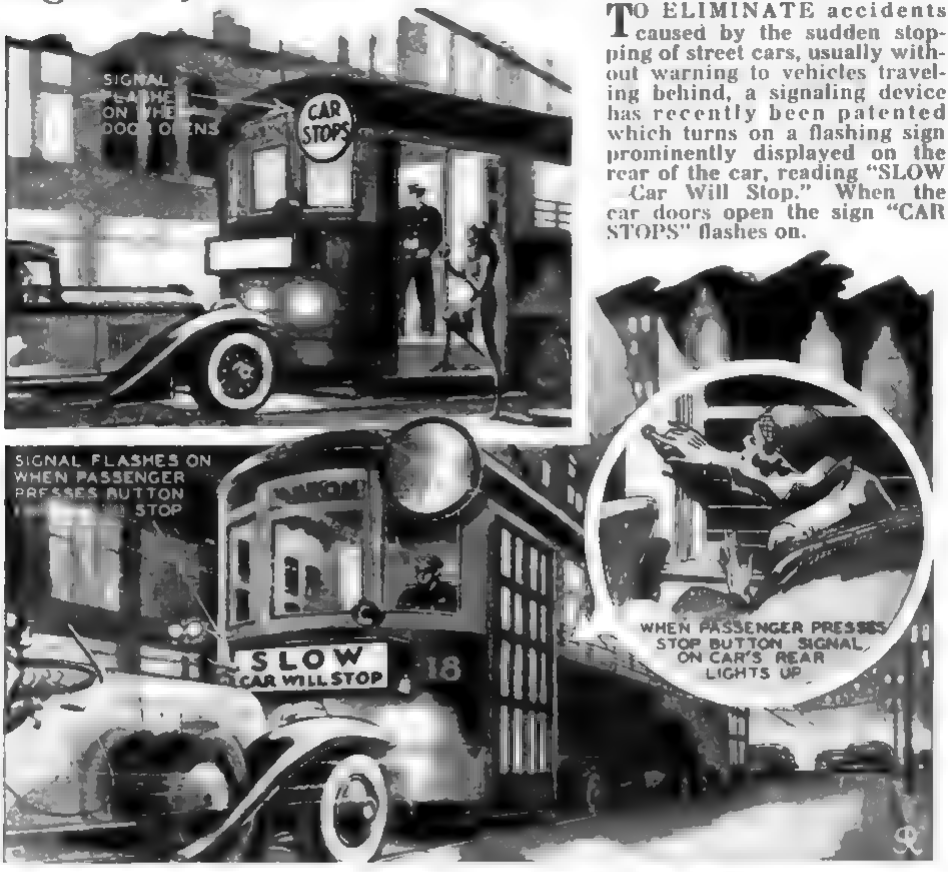
Chain of life belts is suspended below bridge for emergency.

IN AN effort to facilitate rescuing people from the rivers a number of life belts arranged on a rope have been fastened to the bridges in Austria. These belts are suspended below the structure as shown in the photo above.

In case of an emergency, the belts can be easily let down into the water by anyone on the bridge.

# Signals for Street Cars Prevent Accidents

TO ELIMINATE accidents caused by the sudden stopping of street cars, usually without warning to vehicles traveling behind, a signaling device has recently been patented which turns on a flashing sign prominently displayed on the rear of the car, reading "SLOW Car Will Stop." When the car doors open the sign "CAR STOPS" flashes on.



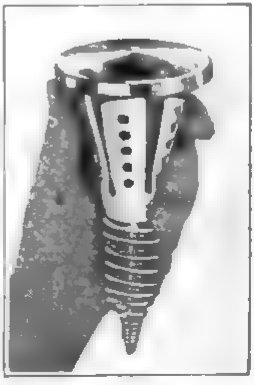

To warn vehicles behind street cars of imminent stops, the sign on rear of car reading "SLOW—Car Will Stop" flashes on automatically when the alighting passenger presses signal button to motorman, as shown in the inset at right above.

## The Invisible Policeman

THE curious incident of an invisible policeman, who was unseen by at least four sane and sober persons and lost his life in consequence, has just been dealt with by the British criminal courts. On the evening of October 14, last, a young student at Oxford University was driving an automobile along a road near that town. Three other persons watched him pass. Suddenly the automobile struck and killed a policeman who was crossing the road. The remarkable thing is that neither the driver of the car nor any of the three watchers saw the unfortunate police officer at all until after the accident. Oculists have formulated only one satisfactory explanation, which is that the background beyond the policeman and toward which the autoist was driving must have had exactly the same reflective power for light as the clothes of the officer, so that he altogether vanished against it like an ink spot on a black wall.

## Tank Cap Prevents Gas Theft

A NEW tank cap that makes it almost impossible for a thief to steal gasoline from parked automobiles has just been placed on the market. It slips into the regular gasoline tank opening, and metal prongs slide under the opening flange so that it cannot be lifted. A coil spring arrangement prevents the introduction of a syphon.



Coil spring under tank cap keeps out thieves' gas siphoning hose.

# Thrills and Spills of the

In this Madison Square Garden scene riders are coming out of end turn into straightaway. Inside rider has just spilled.

*by* ALFRED ALBELLI

**Hitting off a breath-taking clip around a specially-built track, but going nowhere in particular, contestants furnish spectators at the six-day bike races with an abundance of rare thrills. What enables these racers to endure the terrific grind is, in part, a never-say-die spirit, but mainly the mechanical perfection of their steel "mounts," whose amazing construction is described in this article.**

Minor bruises, fractured skulls and broken collar bones are the lots of the six-day bike racers, but they always go back for more. Here's an injured contestant having a snack.

RABID followers of the careers of the six-day bicycle racers—none of which are very long as professions go—have nicknamed their suicidal spectacle "the hospital sweepstakes."

Not so very long ago I went over to the Madison Square Garden to jot down for MODERN MECHANICS AND INVENTIONS readers, a number of the outstanding observations on a sport which is gradually spreading into every large city of the country.

What I wanted to find out was just what features recommended this pastime to thousands upon thousands in the United States and abroad.

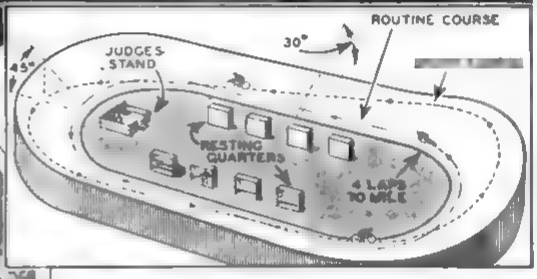
Nothing was ever so obvious, to my way of thinking. Uppermost, one was impressed with the union of courage and skill. It was amazing to note with what nonchalance and carefree daring the riders raced into the pit, facing what seemed inevitable death or mayhem.

If you haven't vibrated to the thrills and spills of a six-day bicycle race during the sprint periods you haven't had any fun yet. Those are the moments when the arena is jammed to the gunwales, so to speak. During these spasms the several thousand spectators go wild with excitement.

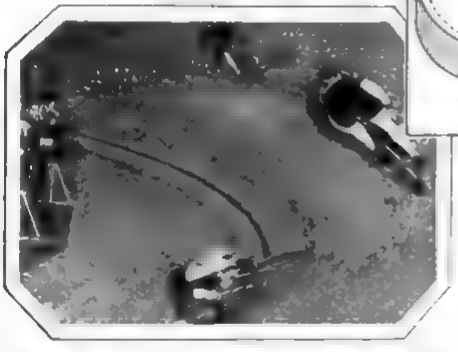
As many as twelve riders will line up for a sprint. They present a dazzling spectacle in their gay-colored jerseys and tights, emblematic of their country and team. They

# Six-Day Bike Races

Many of the most thrilling, which generally means most deadly, of bike races are held at Madison Square Garden. Note angles of the end turns.




This drawing gives the general layout of the track. On routine runs, riders hug the inside of the saucer, but when trying to steal a lap on rivals they follow spurt course. European tracks run 4 laps to mile, while most tracks in the United States have as high as 10 laps to the mile.



Most disastrous spills usually occur at end turns, when riders go into a sudden spurt. Rider here has just crashed. With feet strapped to pedals he is unable to extricate himself.

whiz down the straightaway. One whirl. Another whirl. Speed uncorked to its fullest extent after having been suppressed through several hours of a monotonous grind.

They're going pretty even. Possibly a little more than 45 miles an hour. Suddenly one rider shoots out. He steals away cunningly and manages to keep his pace while others strive to overtake him.

The panic is on! It's coming. You know it's coming. You can feel it. It's in the air. There's going to be an awful spill and someone's going to get hurt in the jumble and shambles.

There it is! That rider trying to pull himself up into second place crossed in front of another fellow, scaring him and making him swerve right into the fellow alongside him.

One, two, three, four, five, six riders are flung to the bottom of the saucer. There is a jangling of bicycle metal and a series of thuds of bodies. The multitudes are on their feet, shuddering and shivering. Doctors and nurses rush to the scene.

### Fatalities Often Occur at Bike Races

But the race goes on. The sprinters who were fortunate enough to have dodged that scrimmage reel past the disabled riders, swerving a little this way or that way as they pass to avoid striking any fallen rider or his bicycle which might be in their path.

When the casualties are discovered it is found that some have suffered minor fractures, contusions and abrasions, while others have sustained broken collar bones or even fractured skulls. Fatalities are often encountered, though such tragedies are becoming rarer.

Stealing a lap, that is, a sudden lunging ahead after having kept a monotonous, even

pace with the others, is almost always conducive to suicide or its near-approach. It is then that the other racers are startled into action. They also spurt up into a sprint to prevent their rivals from gaining the lap. In the mad scramble that follows spills are sure to develop. Then comes the calm again.

Some nasty spills also occur in the motor-paced races which are an added feature of the six-day bike events. In these numbers a bicycle rider will pedal behind a motorcycle which sets the pace. Sometimes the motorcycle driver is forced to put on his brakes, very suddenly. He has to do it to avoid losing his own life or at the risk of serious injury perhaps.

**Absence of Brakes Makes Races Deadly**

This is the point where the absence of brakes on the bicycles works hardships on the riders. The sudden slackening of speed on the part of the motorcycle causes the bike rider to pitch into him. His fragile wheel gets smashed or it gets tangled up in the rear end of the motorcycle, throwing the bike rider headlong. As he falls, he is apt to tumble across the paths of others and again the riders and their vehicles spill pell-mell down the track.

After one particularly deadly sporting fracas was over I thought I'd pose a few questions before Dr. Henry Clauss who ministers to the physical ailments of athletes at The Garden.

The genial doctor was commenting on the courage and gumption of the riders, their never-say-die spirit.

**Broken Bones Mean Nothing to Racers**

"It takes a major injury to make them quit," he explained. "Being knocked unconscious is nothing. While they're still out I usually patch up any cuts, and after they are revived, they require only a short rest before they go back into action again.

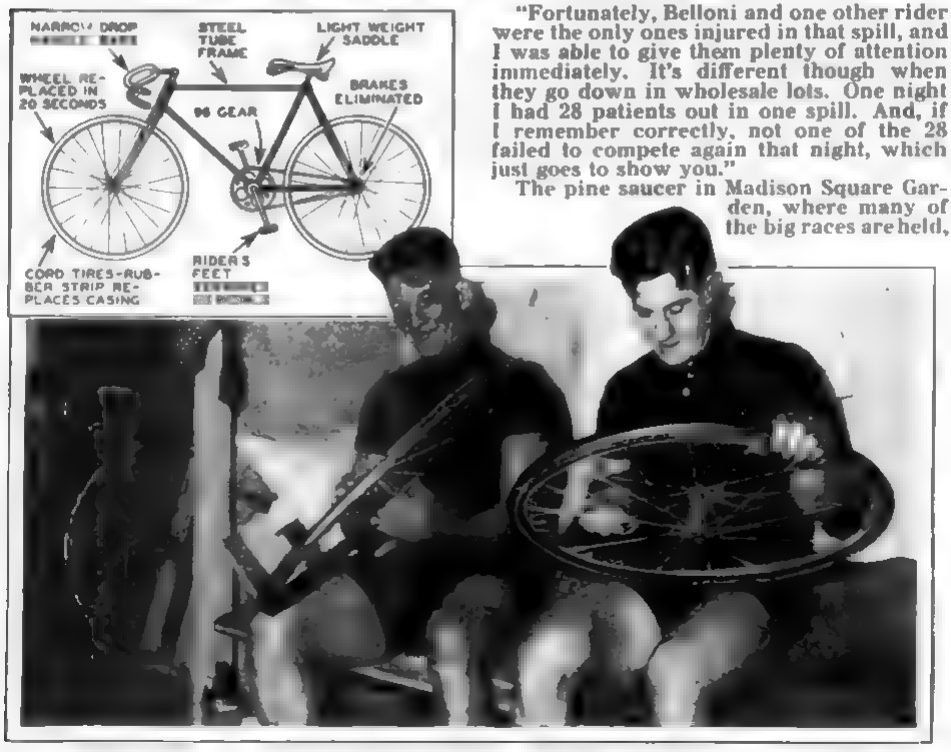
"Of course if a man is injured seriously, his partner is given a certain length of time to secure a new riding mate, but generally they just take time out while I get out my needle and thread and get to work. Even broken bones fail to halt them.

"I've seen some pretty bad crashes," he continued. "The most horrible sight was Gaetani Belloni, when he went into the rail on the turn during one of the six-day races and then slid all the way down to the flat. He was seriously injured to be sure. And yet two days later he insisted on leaving the hospital and was soon en route to his native Italy.

**28 Serious Accidents in One Spill**

"Fortunately, Belloni and one other rider were the only ones injured in that spill, and I was able to give them plenty of attention immediately. It's different though when they go down in wholesale lots. One night I had 28 patients out in one spill. And, if I remember correctly, not one of the 28 failed to compete again that night, which just goes to show you."

The pine saucer in Madison Square Garden, where many of the big races are held,




Here two race contestants (McNamara, famous speed king, on left) are inspecting spare wheels of their bikes during rest period. In drawing at top is seen essential features of racing bike construction. Tires are pumped up to 125 lbs. pressure.

measures ten laps to the mile. The bowl inclines at an angle of 45 degrees and the turns are much sharper than those of European tracks where there are only four laps to the mile. These quick turns are some of the most dangerous spots in the races.

"The construction, by which I mean the engineering principles involved as well as the elementary structure, of the saucer," explained Harry Mendel, an official of the Cycle Racing Association, "must be executed with great regard for the safety of the riders. Faulty construction or the unwise selection of material is apt to result in fatal mishaps.

**Track Material Must Withstand Crashes**

"The ideal six-day indoor race track is built of Canadian spruce. It possesses a pliant quality as well as one of unequalled stability. It does not splinter easily, thereby affording safety when there is a nasty spill with several riders crashing over its surface.

"Its surface is laid like that of a bowling alley. It is glossy and no nails show. The lumber is one inch square and is planed on four sides, so that it can bend around the turns. It is this element of malleability which makes it so adaptable for a race course. The track is laid at a 30 degree angle on the straightaways and it climbs to a 45 degree curve at the four bends. It is at these 45 degree turns that the riders get bunched and are in peril of getting spilled."

**Track Built With 60,000 Ft. Lumber, Ton of Nails**

Pat Mulvey, of Harrison, N. J., outstanding authority on indoor tracks, told me that a six-day bike race track contains 60,000 feet of lumber and that he uses up a ton of nails every time he erects one.

"And I don't have all the time in creation to do it either," he pointed out. "I sometimes have to set them up on very short notice. The last time we were at Madison Square Garden we were due to be ready with our bike track by noon on Sunday.

"There had been a track meet on Saturday night which was not over until after midnight. The Garden had to be cleared out so that the bike race paraphernalia could be moved in. The arena was not cleared and turned over to us until 4 a. m.

"Then we went to work and by noon the last nail was driven and the last strip of spruce was tested and the stage was set for the demon riders."

**Racer Must Have Finest "Mount"**

The smartest of bike race authorities seems puzzled when asked whether the bicycle or the rider is the greater factor. Each is indispensable, naturally enough, but it is further explained that the best rider in the world would be helpless without a good bike, and vice versa.

I asked Mr. Mendel, who was reared in Newark, N. J., the world's bicycle racing mecca, to tell me some of the features of those thin-tired, fragile-looking wheels which are nevertheless so formidable.

*(Continued on page 190)*

From the evidence presented in this photo, you can see that bike racing furnishes a good appetite. Italian racers are shown consuming a native dish.

An added feature of the six-day bike event is the motor-paced races, in which riders pedal along behind motorcycles. Following at a constant distance, the racers can determine their speeds from the speeds of the monitor motor bikes.

# Simple Device Makes Signs Instantly Interchangeable

Extended edges on top of price plate slip into longitudinal slots of the name plate, which is clamped on metal post.

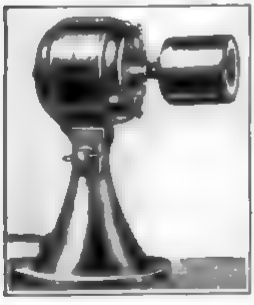
WITH the price of gasoline changing almost daily, station attendants will welcome the new metal sign system, shown on the left, which allows price notices to be changed in a jiffy—without altering the sign's neatness.

The name plate is equipped with a bracket which slips over the metal post and is clamped tight. The lower edge of this plate is bent to provide a flat sleeve and a longitudinal slot. Price plates have a flat, solid head which slides into this slot and is locked by pressure.

## Motorized Razor Blade Sharpener

A MOTORIZED razor blade sharpener can be rigged up from a small fan motor and a piece of typewriter roller from a standard size machine.

Measure off from one end of the roller a distance about a half-inch longer than the razor blade used, and cut off this segment with a sharp hack saw. If the rubber shell tends to slip, drive a tiny finishing nail into the roller and countersink the head.



Flange of typewriter roller segment fits over motor shaft and is locked by a small set screw.

The metal flange of the roller will slip over the motor shaft, and can be locked by turning down the set screw. If the platen segment doesn't run true, it can be lined up by adjusting the flange. Otherwise, cut off another segment from the other end of the roller.

Hold the blade horizontally, about ⅛-in. down from the top of the platen when honing, so that the beveled edge of the blade lies flat upon the wheel.

## New Sponge "Brush" for Shavers

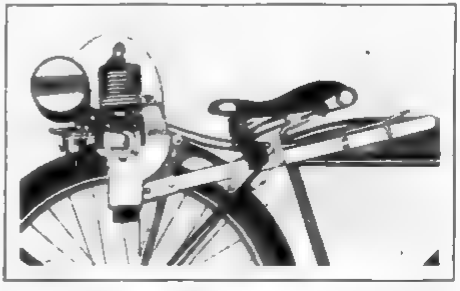
HAIR bristles can't fall out of the shaving brush shown on the right—because there aren't any. A small sponge, shaped like a half-ball with a small cup in the top, is fastened to the handle. To use, wet the sponge, deposit a bit of shaving cream in the cup, and apply. Sponge will work up a dandy lather and is rinsed by dipping in water and squeezing.

Sponge works up a good lather.

## Free Wheeling Motor for Bikes

HERE'S "free wheeling" for bicycle riders! Attached above the rear mud guard, as shown below, a newly developed ¾-horsepower "outboard" motor does all the pedaling and pushes you along at any speed up to 30 miles an hour.

The motor is started either by pushing the bike with motor engaged, or by pedaling with motor disengaged until speed is sufficient to turn it over when engaging lever, attached to cross-bar, is thrown in.



Weighing 29 lbs., this ¾-horsepower motor pushes bike at a 30 mile clip. Bike goes 100 miles on 1 gallon of fuel.

# Fly Trapping Cuts Texas CATTLE Losses

Left—One of these fly traps containing poisoned meat and water is set in a favorable spot, such as a tree, in each 407 acre zone. Above is shown a six weeks' catch.

A QUEER new business has sprung up in the southwestern states—that of fly-trapping. In Texas ranchmen have organized themselves into local associations for the purpose of co-operative trapping.

The principal flies captured are the screw-worm fly and the fleece-worm fly. Both are disease carriers and cause an estimated yearly loss to the live-stock industry of Texas alone of $10,000,000.

In luring the flies, the "trapper" uses two pounds of fresh meat, two gallons of water, and eight cubic centimeters of nicotine sulphate in each trap for the poisoned bait. Inferior goats and sheep are slaughtered and used for the meat, which is removed at different intervals, depending upon the seasons, and new bait put in. Water in the traps is likewise renewed periodically.

Every six weeks the flies are removed from the traps and measured. Test catches at various distances from the traps give an indication of the number and the different kinds of flies which inhabit the "trap area."



The "trappers" go over their zones periodically removing their "catch" and putting in a fresh piece of poisoned bait.

## Device Cures Hay in Any Weather

AN electrically driven machine is now being manufactured which will cure the hay crop regardless of the weather conditions. In the new device the hay is chopped into fine pieces and fed into a revolving cylinder at the end of which is an oil furnace. Hay and hot air are drawn through a drum which dries the hay thoroughly.

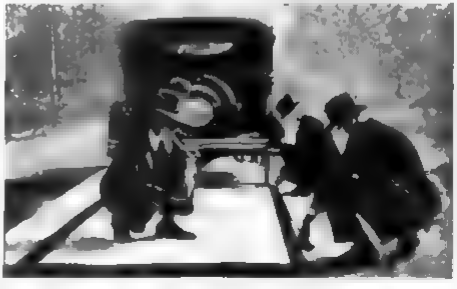
The artificially dried hay retains its natural green color, has a higher protein and fat value, and can be stored indefinitely without sweating, fermenting or discoloring.

## Speeding Cars Stop in One-half Usual Space on New Non-Skid Pavement

SCIENTISTS are working on a non-skid pavement that will enable the speeding motorists to stop on the proverbial dime. At present tests are being made in Georgia on the newly developed porous black-topped surface.

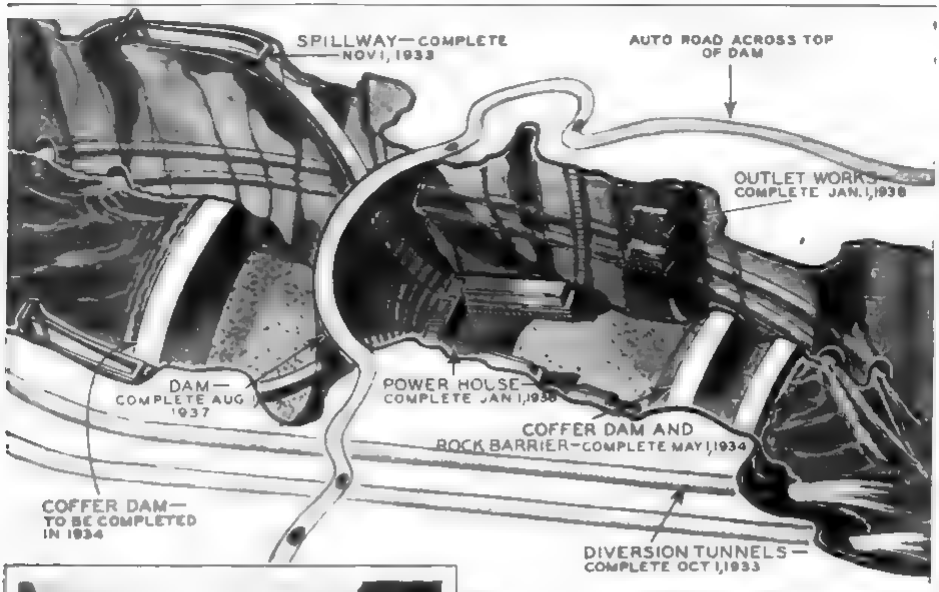
It was found that cars traveling at a 40 mile an hour speed could come to a complete stop in 39 feet, whereas about 80 feet are required on ordinary pavement. At 50 miles an hour the car can be stopped in about half the space required on otherwise surfaced roads.

In making the tests the "penotread" surface was coated with white limestone which marked accurately the points where the brakes were applied and where the car stopped.



In testing the stopping power of non-skid pavement, white lime is put on the road so auto tracks can be measured.

# Startling FACTS About




This schematic drawing shows how Hoover dam is being erected. Diversion tunnels must first be completed.

Top photo shows site with Hoover Dam location drawn in background; bottom, jumbo holding twenty-two drillers.

FIGURES dealing with Hoover Dam, the giant now in process of construction in Boulder Canyon, California, are so huge that the true significance of the statistics is not grasped until some comparison is invoked. The drawing on the opposite page reduces some of the figures to terms which will easily be understood.

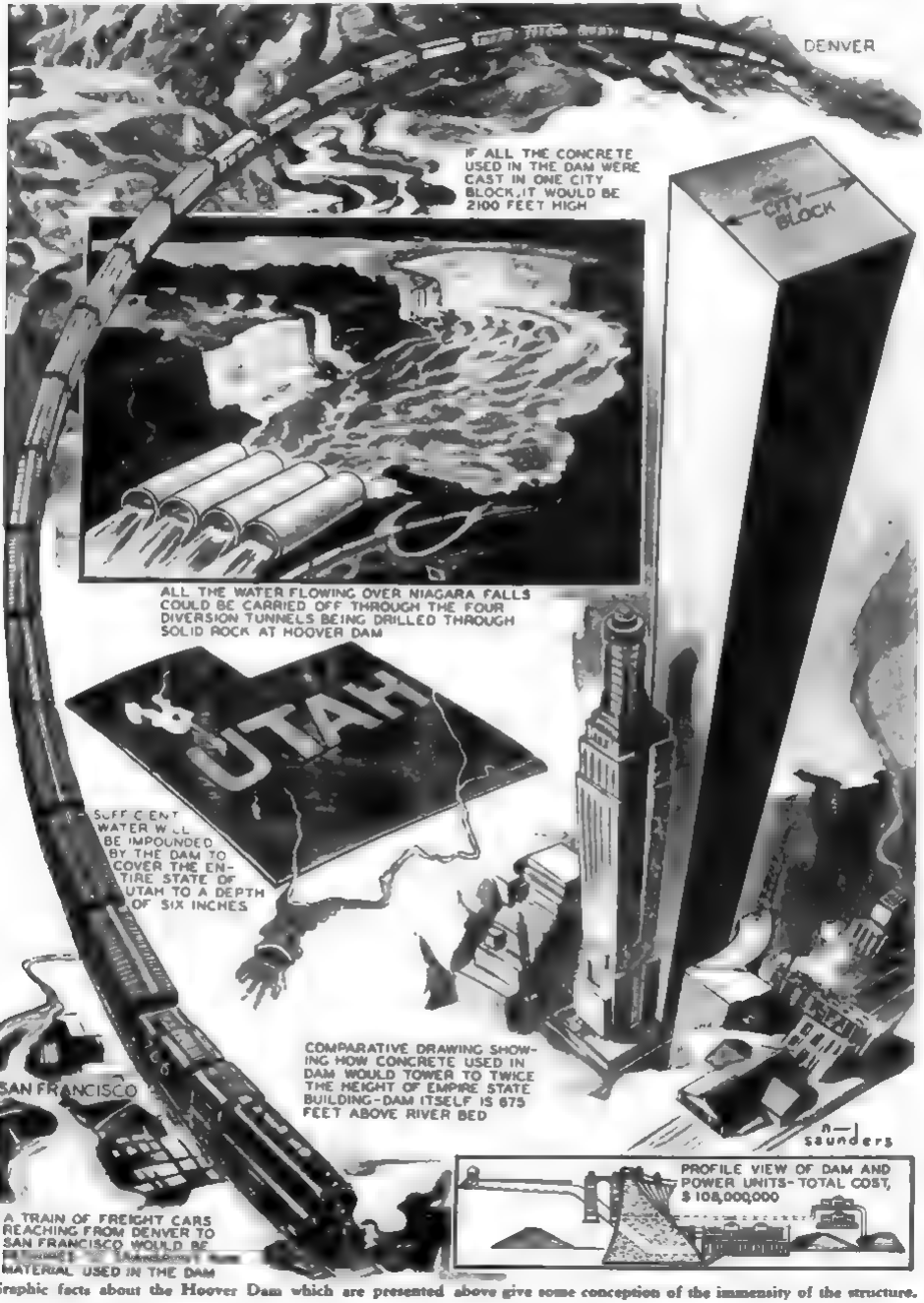
Before work on the dam itself starts, four tunnels must be driven through solid rock to divert the waters of the Colorado river. These tunnels are 50 feet wide, and when completed will have pushed through more than three miles of living rock.

In drilling the tunnels, home-made "jumbos" of unique design are used. These are four-decked auto trucks which permit 22 men to wield air guns against the rock, blasting through 250 feet of rock each day. Not until the tunnels are finished can construction of the dam start, for the river bed must be dry.

The drawing above makes the method of procedure clear. After the tunnels are completed, a coffer dam will be constructed several hundred feet upstream from the site of the dam. Downstream, just above the discharge end of the tunnels, another coffer dam will be erected.

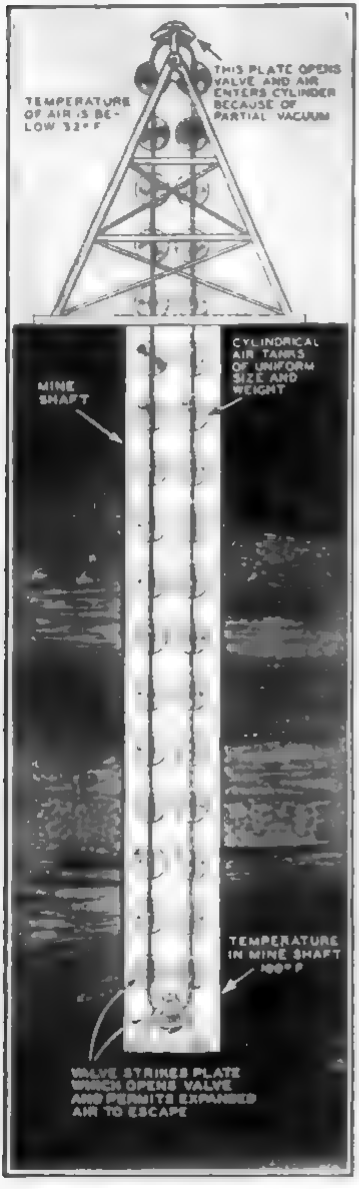
When these are completed, the water imprisoned between the dams will be pumped out and work on the Hoover dam itself will begin.

# Giant Hoover DAM




Graphic facts about the Hoover Dam which are presented above give some conception of the immensity of the structure.

# CASH for Your ANSWER




**THE AUTHOR'S ANSWER:** Dick Cole, who originated this idea, says that it is not a perpetual motion machine, but that it will run, being really a thermal motor deriving its slight power from temperature difference. Remove the external cause and the machine stops. A perpetual motion machine is supposed to generate power within itself to run itself.
Is he right? Read the winning answers of readers published herewith.

**Science puzzle fans who have been following this series in Modern Mechanics and Inventions will find below the best letters on the Perpetual Motion idea published in the April issue —and there's also another problem announced which will net cash returns to a number of contributors. You might as well be one of them!**

WHEW! After going through the pile of letters brought down on their desks by the Perpetual Motion puzzle printed in the April issue of MODERN MECHANICS AND INVENTIONS, the judges are more than a little bit groggy, with a noticeable tendency to see mathematical spots before the eyes and to mumble phrases about atmospheric densities, thermal constants, and cubic volume in their sleep.

Before announcing the winning letters, let's restate the problem, illustrated in the drawing at the left:

**The Perpetual Motion Problem**

A number of cylindrical tanks of exactly the same weight are mounted between parallel chains running over sprockets mounted on a ball-bearing shaft. Tanks are fitted with protruding valve which contacts a plate at top and bottom of shaft, opening momentarily. To start machine, one side is lowered into mine shaft, which has temperature of 100 degrees F. Cold air from top of shaft expands in warmth and at bottom of shaft the valve in each tank is opened momentarily to permit expanded air to escape. Thus one side of chain should be lighter because of slighter volume of air, causing it to rise. Will the machine work, and is it a solution of perpetual motion?

The surprising part about the answers received is the amount of clear, concentrated thinking on the problem which the writers had done. In fact, they discovered so many objections to the possibility of the machine's working that the judges had to award the $10 check to an answer quite different from that of Dick Cole, originator of the idea, who says the machine will work.

Practically all readers spotted the fallacy of the perpetual motion angle, for if the machine operates, it does so not from power generated perpetually within itself, as must be the case with a true perpetual motion machine, but because of an outside force—in this instance, temperature of the air.

The $10 check goes to C. A. Meilicke, 3466 North Clark Street, Chicago, Ill., for his concise answer, typical of the many which pointed out the fundamental fallacy of the machine. Here it is:

> **Ordinarily one would suppose that the air deep down in a mine shaft would be lighter because it is warmer.**
>
> **It is true that as we descend into the earth the temperature rises, that is, one degree for every 100 to 500 feet of descent, depending on locality. Assuming in this case that the temperature rises one degree for each 121 feet of descent, then for a difference of 68 degrees we would need to descend 68x121 or 8228 feet.**
>
> **It is also known that the sea level barometer reading 29.92 will increase one inch for each approximate 900 feet of descent.**

# *to these* BRAIN-TICKLERS

The problem as stated above is a real poser until you have separated out its essential elements in your own mind. There aren't any tricks in it—all that's required in the answers which will win cash for their writers is a bit of clear thinking. The forces of gravity and acceleration and the law of inertia are among the principles to bear in mind.

## *$10 for the Best Letter on This Falling Scales Problem*

**For the best letter answering the problem of the falling scales, as shown in the drawing at the right, $10 will be paid; all other letters used will be purchased at regular rates. Here is the problem:**

**Two scales, one operated by a spring balance and the other by conventional lever and weight, hold 100-lb. weights and register 100 lbs. on their dials while resting at the top of an elevator shaft. The elevator cable suddenly breaks. What figures will the scales register while falling, ignoring air resistance and friction?**

**Letters should not be over 200 words in length and should be mailed before July 15, 1932, to the Falling Scales Editor, Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis, Minn.**

**The rise in the barometer reading at the bottom of the mine shaft will then amount to 8228 ÷ 900 or 9.14 inches, or will read 39.06 inches.**

**Having ascertained the barometer reading and knowing the air temperature, we can determine the weight by the formula:**

$$\text{Weight} = \frac{1.3253 \times B}{459.6 + T} \quad \text{or .0866 pounds per cubic foot.}$$

**This compared to .0827 pounds, the weight of a cubic foot of air at sea level, proves the contrivance cannot operate, because the air, contrary to belief, really is heavier at the bottom of the mine shaft than at the surface.**

**Sincerely yours,**
**C. A. MEILICKE.**

Another contributor who arrives at the same conclusion with somewhat different figures explains his conclusion as follows:

**The proposed perpetual motion machine does not violate the principle of the conservation of energy as it obtains power from an inexhaustible reservoir of heat energy which exists in the interior of the earth. The machine does, however, violate a much simpler principle of physics. It assumes a definite volume of air to be heavier at the surface than it is down in the mine shaft. How could**

*(Continued on page 181)*

# LIGHTNING—*Playboy*

**Do you know what "black lightning" is—how lightning creates fertilizer for the fields—which legends about it are true and which ones false? This fascinating story of lightning's vagaries reveals it as playing odd pranks on human beings as well as causing fires and destruction.**

ACCORDING to a recent estimate, about 100 flashes of lightning occur *each second*, on an average, in the entire world. Except in some uninhabited parts of the polar regions, there is no place on earth where lightning is entirely unknown, and there are portions of tropical Africa where it is seen on more than two hundred days every year.

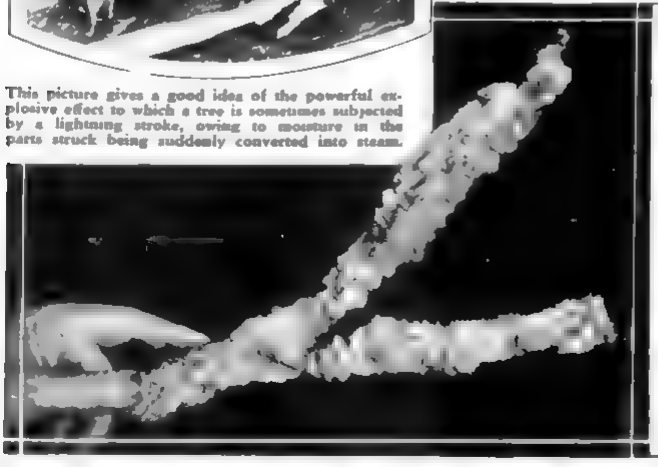
This picture gives a good idea of the powerful explosive effect to which a tree is sometimes subjected by a lightning stroke, owing to moisture in the parts struck being suddenly converted into steam.

Thus practically every human being who isn't blind is familiar with its appearance, but few people realize the great variety of things it is capable of doing when it descends from the skies. It does *not*, as often alleged, turn milk sour. It does not, as our grandfathers believed, produce the bare circles on sod known as "fairy rings," and it does not, as most primitive races have believed, pelt the earth with stony thunderbolts, but it performs many feats quite as strange as these mythical ones

### Lightning as a Fire Cause

The deeds of lightning are sometimes terribly destructive. Probably the costliest lightning stroke in all history was one that occurred on the afternoon of July 10, 1926, at the United States Naval Ammunition Depot at Lake Denmark, N. J. This stroke started a series of explosions that killed 31 people, injured hundreds, and entailed property damage estimated at $93,000,000.

Strange to say, the same year that witnessed this unprecedented disaster in the eastern part of the United States was marked by the occurrence in California of oil fires due to lightning with aggregate losses of $20,000,000. Lightning is by far the commonest cause of forest fires in the



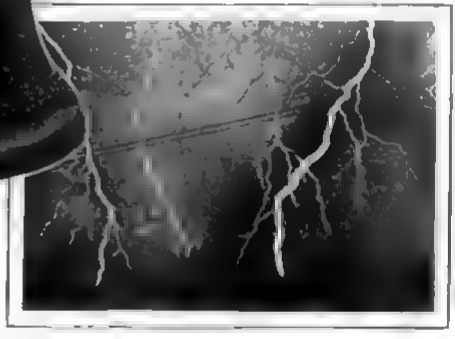
Above is a fulgurite, or tube of glass formed by lightning striking in sandy soil, the heat fusing the sand. At right above is shown the path left by a lightning bolt traveling down a chimney—note how it traveled underneath some of the bricks.

# of the Storm Skies

by CALVIN FRAZER

These 47 cattle were killed by a single lightning stroke during a "dry" thunderstorm near Hancock, Minn. They were crowded together and in bodily contact with one another when a bolt struck them.

At left, a French church bell pierced by lightning, a hole being melted through it near its top. Old World tradition regards the ringing of bells as protection against lightning, but it didn't work in this case.



This photograph shows flashes of "black" lightning, which is merely a photographic phenomenon caused by a second flash of lightning reversing the image on the plate which has already registered the bolt occurring a second before.

western states, and throughout the country it is estimated to cause the death of about 500 human beings, on an average, each year.

In contrast to these disastrous effects, many of lightning's doings are whimsical and even amusing, rather than harmful. In a collection of anecdotes published years ago by the French astronomer Camille Flammarion several cases are recorded in which lightning snatched things from people's hands and carried them away to a distance.

### Drinking Mug Carried Away

"There is a case," says this writer, "of a mug being thus spirited away from a man who had just been drinking from it and deposited undamaged in a courtyard near; the man himself suffering no injury. A youth, holding a missal from which he is singing, has it torn from his hands and destroyed. A whip is whisked out of a rider's hand. Two ladies, quietly knitting, have their knitting-needles stolen. A girl is sitting at her sewing machine, a pair of scissors in her hand; a flash of lightning, and her scissors are gone, and she finds herself sitting on the sewing machine. A farm laborer is carrying a pitchfork on his shoulder; the lightning seizes it, carries it off fifty yards or so, and twists its two prongs into corkscrews."

There are several records of iron and copper nails being pulled out of furniture by lightning while the woodwork remained uninjured. Clocks and watches are often stopped by lightning in their vicinity, on account of its magnetizing effects. In one case a ship was struck by lightning; none of the passengers were injured, but all their watches stopped at the moment the stroke occurred.

### Bolts Undress Victims

One well-known prank of lightning is to undress its victims; sometimes without doing them any bodily harm. As an offset to the painful injuries it often inflicts, lightning is said, in certain cases, to have cured human beings of blindness, deafness, dumbness, paralysis and rheumatism. One of the most remarkable tales cited by Flammarion—vouched for as true by a Polish countess — relates to a stroke of

lightning that entered the open door of a stable in August, 1901. There were twenty cows in the stable. The lightning is said to have killed every alternate cow, beginning with the one nearest the door, while the other ten were not even injured. Page Mr. Ripley!

### "Lightning-Tubes" Fused From Sand

Glassy formations called fulgurites, or lightning-tubes, due to the fusing of loose sand along the path of a lightning discharge beneath the surface of the ground, are well known to science, though they are not very common. Fine specimens may be seen in the National Museum, in Washington, and in museums elsewhere. They are of various sizes, from a fraction of an inch to several inches in diameter, and in some cases extend more than 25 feet into the ground.

The inner surface is of smooth glass, while the outer consists of rough, incompletely fused particles of sand and often bears longitudinal ridges and furrows. The tubes are frequently twisted in spirals and are sometimes branched. At one time fulgurites were believed to be formed by excretions from the roots of plants.

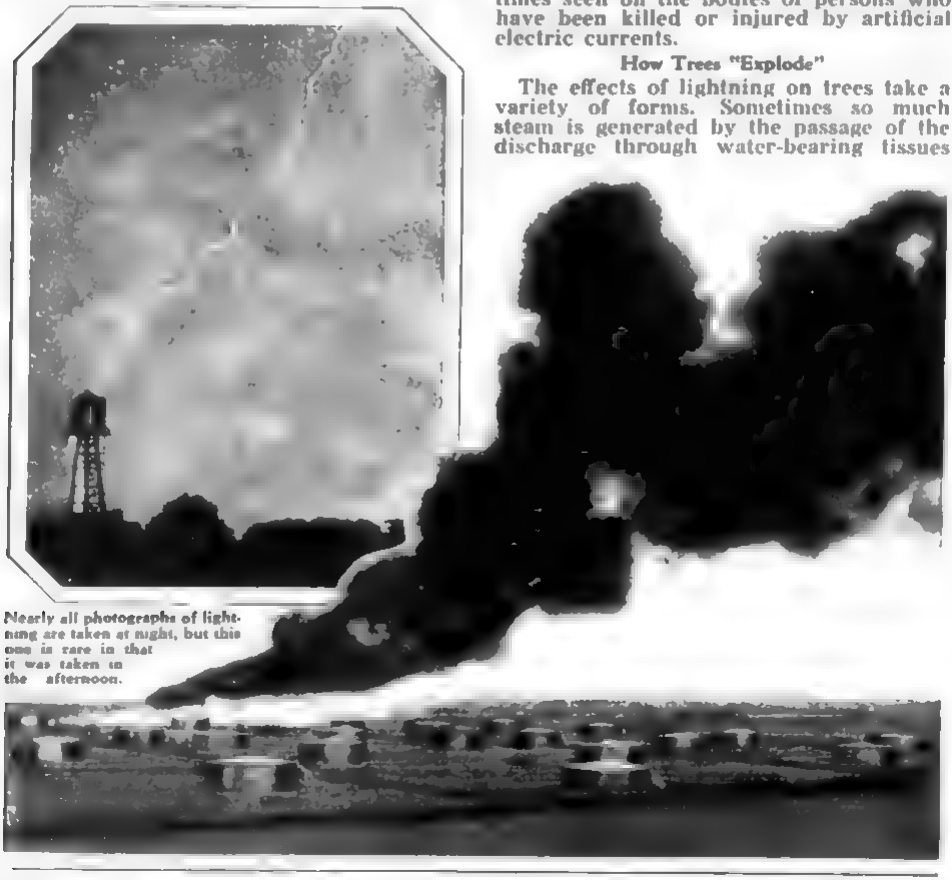
Another curious way in which lightning sometimes leaves its "autograph" is the production of branching pink marks, called lightning-prints, on the skin of a human being or other animal who is struck by lightning, with or without fatal results. When the victim recovers, the marks fade away in the course of a day or two.

### Lightning Prints Are Really Burns

These marks were once believed, even by some scientific authorities, to be photographs of trees or other vegetation growing near the place where the lightning occurred, but the true explanation is much simpler. A lightning-print is merely the trace left by the passage of a branching electrical discharge through the tissues of the body. In other words, it is a species of burn, and it is sometimes seen on the bodies of persons who have been killed or injured by artificial electric currents.

### How Trees "Explode"

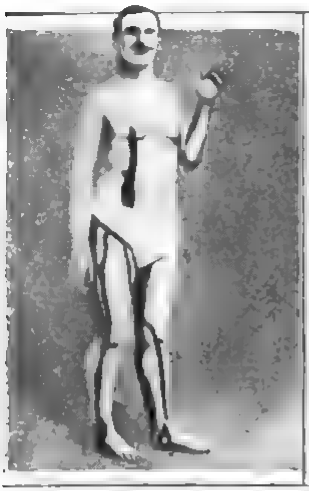
The effects of lightning on trees take a variety of forms. Sometimes so much steam is generated by the passage of the discharge through water-bearing tissues



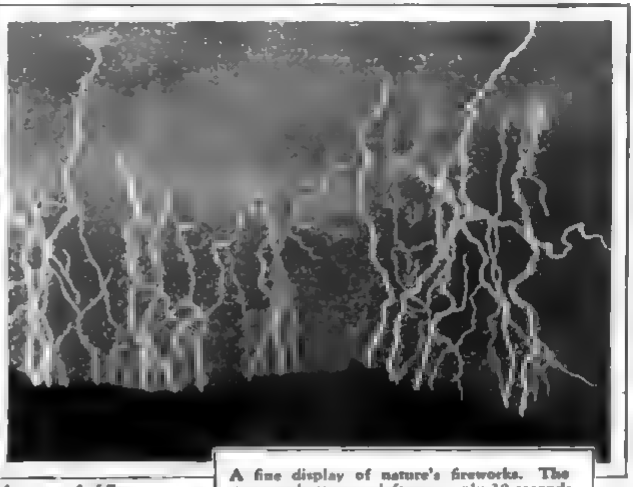
Nearly all photographs of lightning are taken at night, but this one is rare in that it was taken in the afternoon.

Most fires in the oil fields are caused by lightning, as was this costly California one shown in the photograph above.

## *Lightning Does Not "Photograph" Scenery on Skin, as Tradition Believes*



The victim of lightning burns pictured above was holding an umbrella in his left hand. The charge passed down the metal umbrella handle into his hand and thence through his body to the ground, leaving marks on his body as shown.



A fine display of nature's fireworks. The camera shutter was left open only 30 seconds to register all these discharges.

Here is an example of the fringe of fine pink lines left on the skin of a person struck by lightning. These have been superstitiously regarded as photographs of surrounding trees and scenery imprinted on the skin by lightning, but the true explanation is that it is a species of burn, recording the passage of a branching electrical discharge through the tissues of the body.

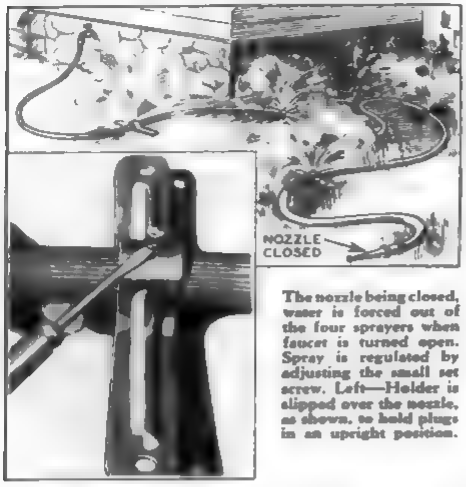
Lightning has left its trail down the trunk of this elm tree. Cases have been reported in which lightning has divided the trunks of trees into two concentric portions.

that the whole tree is blown to pieces. The removal of long narrow strips of bark is a common effect. In some cases lightning produces numerous small spots and blotches on twigs and branches, easily mistaken for the effects of parasitic diseases.

Lightning injuries are frequently hidden beneath the bark and revealed only as scars in the annual rings when the tree is cut down. They often take the form of false rings, which, like those due to frost or disease, are a common source of error in counts of annual rings made to determine the age of the tree or to fix the date of some event in its life history. Cases have been reported in which lightning divided the wood of a tree trunk into two concentric portions, like the "telescoping" tubes of a spyglass.

A fact of interest to farmers is that the process of "fixing" atmospheric nitrogen, now carried on so extensively by artificial methods for the production of fertilizers, is also performed by Nature in the thunderstorm. Every stroke of lightning produces ammonia and other nitrogen compounds from the gases of the air, and these fertilizing substances, brought down by rain, help to enrich the soil. A French authority estimates that in the Tonkin Delta of Indo-China, where thunderstorms are very frequent, the natural fertilizers thus supplied from the sky are worth at least $20,000,000 a year.

# Garden Hose Equipped With Four-Plug Sprinkling System




The nozzle being closed, water is forced out of the four sprayers when faucet is turned open. Spray is regulated by adjusting the small set screw. Left—Holder is slipped over the nozzle, as shown, to hold plugs in an upright position.

PERHAPS the greatest inconvenience of ordinary sprinkling devices is that they must be moved about a great deal in order to water all the dry spots. The fifty-foot hose shown at the left, is equipped with sprinklers spaced every ten feet, thus watering four spots at once.

When using, the nozzle fastened on the end is screwed shut so that water is forced out of the outlets which are held upright by the metal holders shown in the photo.

Plugs are adjustable so that the spray can be regulated. By closing the plugs, the hose can be used in conventional manner.

## Glare-proof Glasses Aid Drivers

HEADLIGHT glare from approaching cars is practically eliminated by the cup-shaped aluminum shields shown on the left, which fasten onto regular spectacle frames.

Fastened on spectacle rims, these cone-shaped shields cut off headlight glare of approaching cars.

Holes are cut a little to the right of the apex of the cones, which are one inch deep. When meeting a car, driver turns his head slightly to the right. This automatically cuts off the glare from the lights and enables him to watch the side of the road.

Holes in the sides of the cups aid wearer in watching cars at intersections.

## Treatment for a Blotched Skin

THE disease called acne, characterized by pink, inflamed spots on the face or neck, is best treated by simple remedies, which include soap, water and diet. The diet should include no alcoholic beverages or fried foods, very little meat, and no starch, sugar or other carbohydrate foods. Instead, eat plenty of fresh vegetables and fruits, and drink a lot of water.

The local treatment consists of rubbing the skin with plain soap and water, the subsequent application of hot towels for ten minutes, then a wash of cold water and rub with ice.

## Portable Wash Stand for Campers

MANY conveniences are denied the camper because the fixtures are too bulky to be transported easily in the car. The wash stand, shown at the right, can be knocked down and packed into a box measuring 12″x18″x3″, and will prove handy around the camp.

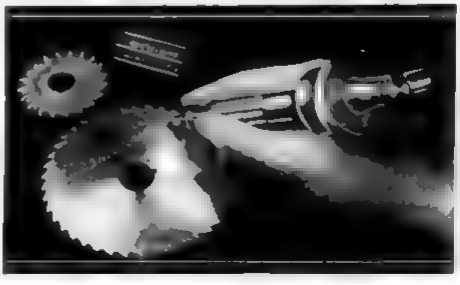
The outfit consists of a metal frame, a wash basin, drinking glass holder, soap dish, comb, mirror and toothbrush holder.

Camper's wash stand is shown above, set up and ready for use.

## Air Pencil Writes on Steel and Glass

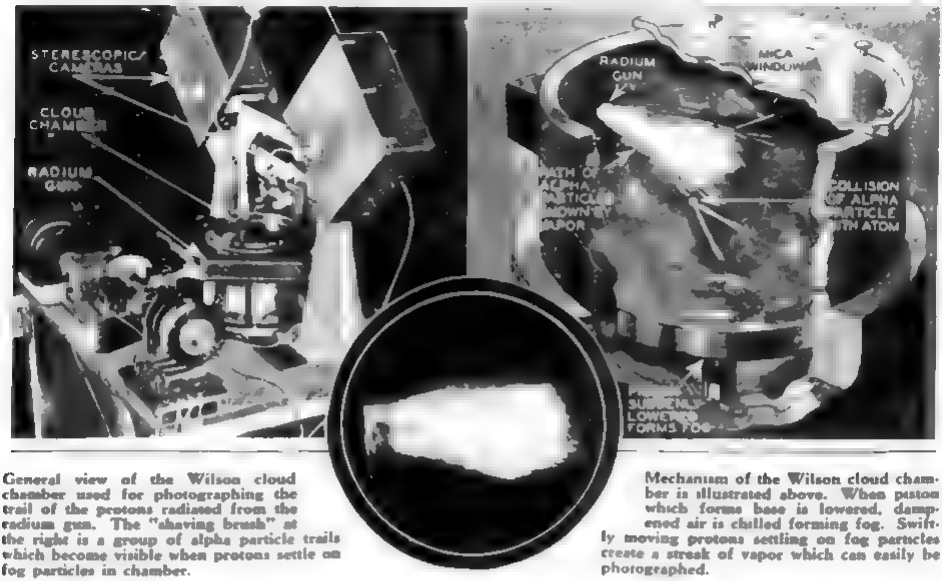
MARKING tools and glass ceases to be a slow procedure with the invention of a new "pencil," with which one can write on hardened steel, glass, lead-coated stock and painted surfaces almost as fast as he can write with a lead pencil.

The "pencil," shown below, is run by compressed air fed through a tube.



This "pencil" is run by compressed air and writes on steel.

# Science Photographs TRAIL of the ATOM




General view of the Wilson cloud chamber used for photographing the trail of the protons radiated from the radium gun. The "shaving brush" at the right is a group of alpha particle trails which become visible when protons settle on fog particles in chamber.

Mechanism of the Wilson cloud chamber is illustrated above. When piston which forms base is lowered, dampened air is chilled forming fog. Swiftly moving protons settling on fog particles create a streak of vapor which can easily be photographed.

## Rapid-fire Cannon Fights Planes

AN AUTOMATIC cannon which promises to alter considerably the nature of aerial warfare in the future has been developed and tested by the U. S. Army. Shooting bottle-necked cartridges fifteen inches long at a rate of 150 shots per minute, the gun, shown in the photo below, proves exceedingly effective as a ground defense against airplanes.

The operation of the cannon is entirely automatic.

Highly effective against aircraft, this rapid fire cannon shoots cartridges 15 in. long at rate of 150 rounds per min.

SCIENCE knows that atoms exist, despite the fact that they have never been seen. Although modern microscopes are extremely powerful and can magnify an object as high as 17,000 times, yet even the best of these instruments fail long before the atom is reached. Science, therefore, in the study of the atom must employ indirect methods.

One of the most amazing devices which scientists have contrived to date to study atomic particles, which are of the order of a hundred-millionth of an inch in diameter, is the Wilson cloud chamber, developed by Prof. C. T. R. Wilson, a distinguished English physicist.

With this instrument scientists are able to photograph the trails of the atoms and study their peculiarities, although the atoms cannot be viewed directly. The mechanism of the cloud chamber is illustrated in the drawing above. It consists essentially of a cylindrical box of brass, with a mica top and a base which can be lowered suddenly.

When this occurs the damp air in the box is chilled by sudden expansion, forming a fog. This fog in turn settles on any convenient solid nucleus. Thus if swiftly-moving alpha particles, or protons, from the radium gun pass through such a space which is saturated with water vapor, each individual particle or proton, on account of its electrical charges, produces in its path little droplets of water. It is then that a streak of fog arises which may be photographed and which marks the path of the particle or proton.

# Eight New INVENTIONS to

This electrically driven midget washer does a first class job and is just the thing for a small buffet

Attractively polished metal balls containing water sealed inside cool beverages without diluting them. A vacuum is left in the ball to take care of the expansion and contraction of the water. They are frozen in a refrigerator just as ice cubes, but can be refrozen indefinitely.

This special attachment plug for electric irons has a heat controller unit built in it. The plug is used like any other, but has a control button on the side for regulating heating element to the desired temperature. It's ideal for either slow or fast ironing.

Chipped ice for salads, cocktails, etc., can now be made in the small breaker shown on the left. The ice, either cubes or otherwise, is fed automatically to the crunching mechanism, which is operated with an eccentric motion when crank is turned, and comes out in uniform pieces for the table.

***Modern Mechanics and Inventions Editors Will Furnish You With***

# SIMPLIFY Household Tasks

Soup that comes in sticks is one of the newer ideas in foods. The stick, shown above, contains six cylindrical pieces of dried and compressed ingredients—enough for six servings. In preparation, each piece is mixed with one cup of water and allowed to simmer for 15 or 20 minutes. Many flavors are available.

It's soon time for corn-on-the-cob, and this little metal container will keep the individual servings hot during the meal and add to the attractiveness of serving by keeping the used cobs covered and off the plate. The small metal handle is pushed into the end of the cob to facilitate handling when eating.

Here is a handy spot cleaner for the household. Cloth is filled with cleaning fluid when pad is pressed on spot. When pad is removed, it sucks out the cleaner along with the dirt dissolved in it, returning fluid to container for filtering before being used again.

With this new gouging utensil, shown on the right, it is a simple matter to remove the centers from grapefruit so that the sections may be more easily taken out when eating. The hinged circular cutting edge is pressed into the fruit, around the center. When handles are shoved apart, cutters close about the base of the center and snip it off. In this manner, the center is removed neatly and quickly, a feature that busy housewives will appreciate and welcome.

***Addresses of Manufacturers of Household Aids Shown on These Pages***

# Guitar Playing Simplified by Clever Fingering Attachment

Chord is "fingered" by pushing down one of the 24 levers.

PLAYING the guitar, lute or banjo-guitar without a knowledge of notes is a simple procedure with a new apparatus, recently invented in Germany called a "Guitarion."

The device consists of 24 levers—six oblique rows of four levers each -and is fastened on the neck of the instrument as shown at the left. Each lever fingers all six strings, blending them harmoniously to the chord.

The instrument is held in the conventional manner, the fingers of the left hand operating the levers and the strumming being done with the right hand.

## Auto Is Safe Refuge in Storm

ACCIDENT statistics indicate that people caught out in automobiles during a thunderstorm are almost immune to being struck by lightning. The cause for this is that a more or less complete cage of electricity-conducting metal formed by the tonneau is a good protection if a lightning bolt does strike. Wet tires act as a ground.

## Metal Frame Keeps Ties in Shape

When wrinkled tie is slipped over metal frame, tension of "arms" pulls out the creases.

KEEPING ties fresh and free from wrinkles is a simple matter if you have one of the new "shapers" shown on the left. The soiled tie is slipped over a V-shaped metal frame and left there for a short time.

The tension of the "arms" will pull out the wrinkles and make the tie look just as fresh as the first time it was worn.

## Pocket Watch Run by Electricity

YOU can forget about winding your watch—for a year, at least—if you carry one like that shown in the accompanying photo. It is entirely electric and the charge in the small battery will keep it running for a year. After that, the battery can be recharged with an ordinary wireless set and your winding worries are over for another year.

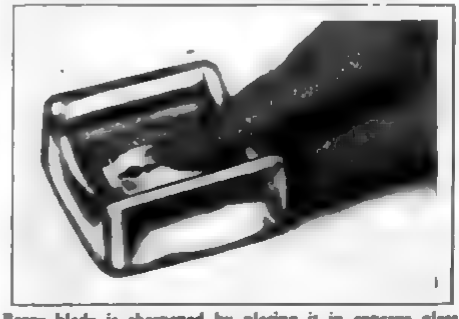
The watch, no larger than the ordinary article, was made by Georges Pallaton.

Small battery has sufficient charge to run watch one year.

## Crystal Stropper Sharpens Blades

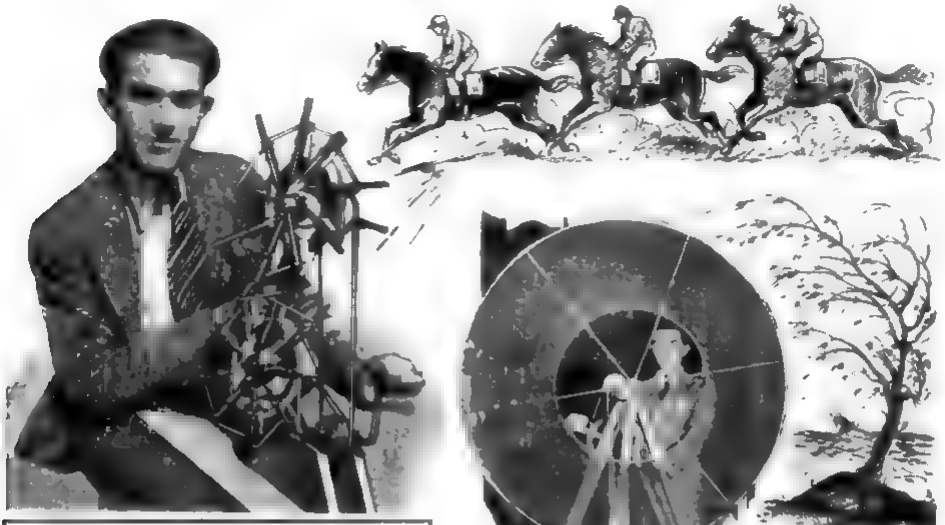
DISCARDED dull razor blades are given a super-keen edge in less than thirty seconds when pushed from side to side with the finger in the concave crystal stropper shown below, which is now being marketed.

The surface of the crystal matches the beveled edge of the blade perfectly. No abrasives are used in the process and any standard safety razor can be sharpened in the stropper in this simple manner.

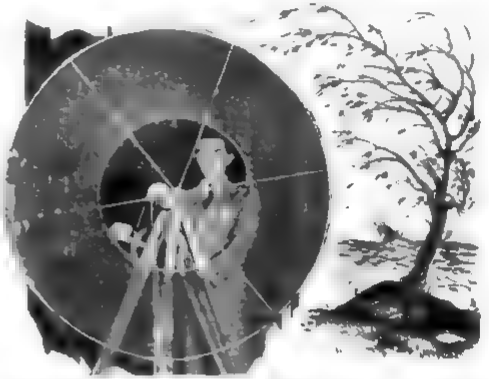


Razor blade is sharpened by placing it in concave glass stropper and pushing it from side to side for a few seconds.

# Movie Sounds from Queer Machines



When horses clatter down the street on the talkie screen, you can wager that the sound of their hoofbeats has been registered by a machine like that shown above. Arms on the two crank-turned wheels strike against metal brackets. The device is used mainly in comedy work.



Delicate microphones have difficulty recording wind sounds out of doors, so a screen-covered circular frame, shown above, is used as a substitute. Rapid rotation of the wheel creates the effect of a wind storm. More violent gale effects are obtained by using a wheel similar to this, but rimless and without a screen, the rapid threshing of the spokes through the air doing the trick.

Earthquakes must frequently be recorded in the talkies, and of course, nature can't be depended on to supply these sound effects for the director. On such occasions the huge drum shown above is brought into action. Bowling balls are placed inside the metal drum, which is then revolved by a hand crank. The rumbling of the balls over obstructions sounds as impressive as an earthquake to the recording ear of the microphone. If the bowling balls are replaced by small pebbles, the effect sounds like the patter of rain. Murray Spivak, Hollywood sound effect director, is shown at the crank of the machine. Considerable skill is demanded of the director, who must not only design ingenious machines for special effects, but must operate them in perfect synchronism with the pictured action.

You wouldn't suspect that the vox humana pipes from an organ would sound like the grunts of hogs on the talkie screen, would you? Yet that's exactly what happens. Of course, the tone of the pipes is pitched considerably lower than normal. The operator produces the sounds by blowing a quick burst of air through the pipes.

# Fortune Making IDEAS

**A lot of inventive genius is going to waste merely because inventors are not aware of the greatest needs of the public. This month again Mr. Yates outlines six inventions which, if developed, will be immediately accepted by the public.**

I AM rather amazed at the large number of men who, due more to a lack of knowledge of the patent laws than anything else, are haunted by the fear that their ideas will be stolen and for that reason are extremely reluctant to send me a drawing of the idea that they have in mind.

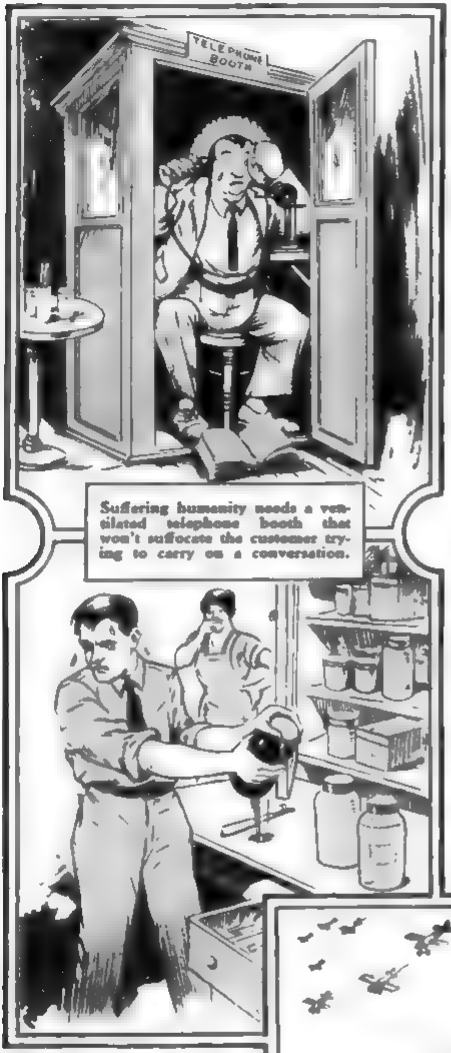
At the same time they will timidly discuss meager details and give me a very hazy outline, from which they expect me to give them advice. My position in such cases must be obvious. I am not a mind reader.

Having ideas witnessed before notary publics will insure safety, but even that is not wholly necessary. If the idea is first shown to trusted friends or members of one's family, the effect will be that of insuring greater safety, for these people, knowing the details of the invention, would make good witnesses in court should the matter ever have to be adjudicated.

If my readers will send drawings, it will save me a great deal of time, for I shall not have to write and ask for more complete details.

### *1. Telephoning in Comfort*

Those who have used a telephone booth on a very hot day will appreciate this suggestion and might do something to relieve suffering humanity. What is needed is a telephone booth that will be properly ventilated and that will remain at a tempera-




Suffering humanity needs a ventilated telephone booth that won't suffocate the customer trying to carry on a conversation.

Above—When a fruit jar has to be opened the strong man of the house must be called to do the job, and he usually fails, despite much exertion and profanity. Housewives demand a leak-proof and easily opened jar. Right — With airplanes growing more numerous each day, the roar will soon become unendurable, especially around airports and large cities. Plane manufacturers will gladly pay a fortune to the inventor who will supply them with a silencer or muffling system which will absorb, or otherwise eliminate, the terrific din of the motor.

# for INVENTORS

by Raymond F. Yates

## For Inventors Wanting Advice

Mr. Yates, who conducts this department for inventors, stands always ready to give advice on patent, law and marketing procedure. When requesting advice, however, do not send models, as they will not be accepted. All that is necessary is a clear drawing and complete constructional data. Stamped return envelope must be enclosed. Address Mr. Yates in care of Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis, Minn.

ture where one may carry on a conversation without having to hold the receiver with one hand while mopping the wet brow with the other.

This is by no stretch of the imagination an easy problem and telephone engineers have long since given it up as a bad job. However, that does not mean that some lucky fellow will not come along some day with a solution to the problem.

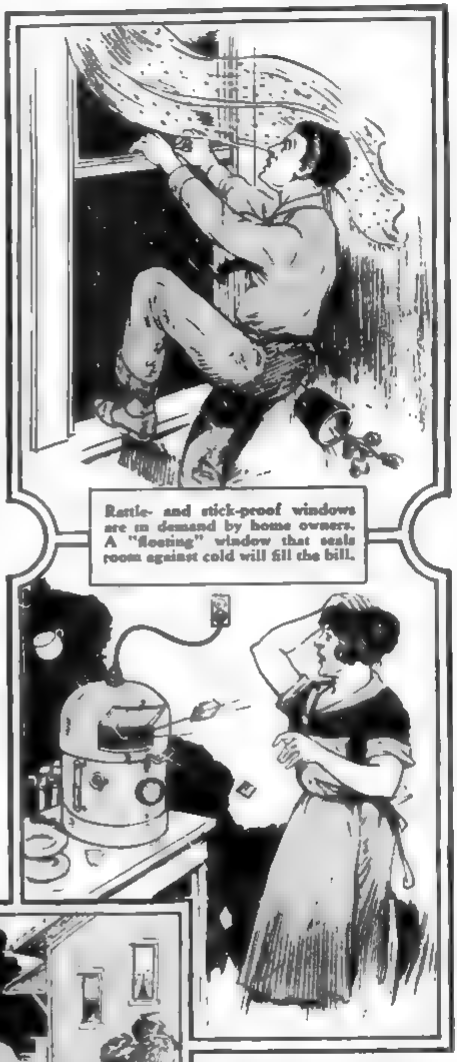
Specifications: If possible, the ventilator should not be electrically driven nor should it have any moving parts. Yet the system used should be able to empty the booth of air at least once a minute. Naturally, cost is here a great item when the thousands of telephone booths used throughout the country are considered.

Exploitation: Should be patented in this country only and should be sold outright. I should say that this invention should be worth at least $50,000.

### 2. *Leak-proof Fruit Jars*

Keeping to my idea of presenting my readers with ideas concerning simple things, I mention the homely fruit jar. The present fruit jar spoils a lot of preserves because it does not properly seal the contents. We need a real leakproof jar, one that can be guaranteed. Not only should the jar be leak-proof but it should also have a top that

*(Continued on page 182)*



Rattle- and stick-proof windows are in demand by home owners. A "floating" window that seals room against cold will fill the bill.

An efficient, yet inexpensive automagic dish washing device will win a warm place in the hearts of millions of over-worked housewives. Rotary brushes can clean, while hot air can dry, the dishes. Left—There's a fortune waiting the lucky fellow who will develop a dwarf species of grass that will relegate the lawn mower to oblivion. The grass should be hardy, but should not grow over an inch, or at most, over an inch and a half high. The government now permits embryo Burbanks to patent products.

# Why Snapshots Go Wrong

**Making clear, snappy pictures is a surprisingly simple procedure—if you know just how to go about it. Otherwise the cause of your poor photographs may always remain a mystery. If you want some good inside information on the secrets of successful picture making read this timely article.**

AMATEUR picture makers could save up to twenty-five cents on each roll of film they exposed and get a lot more pleasure out of button pressing if they really wanted to. All that is necessary is to look over the finished prints and from them, like a palmist reading a life line, learn what is wrong and how to correct the fault.

Fifteen, or certainly not more than twenty, percent of the average run of films turn out sufficiently well to be called good. Of the remainder the failures are caused by little things easily overcome, but which most picture takers accept as a matter of course.

There is no reason why every exposure on a roll of film should not turn out brilliant and snappy, exactly as you had pictured it in your mind when pressing the button.

Correct exposure is one big trouble, of course, but it can easily be overcome. In using a box camera never try to take a picture unless the subject is in a good, bright light. With a folding camera having adjustable diaphragm use an exposure meter. Even the expert cannot always

Fig. 1. When a picture turns out fogged as in the one at the left, the cause is generally found in a cracked bellows, admitting light which strikes the negative. Remedy: paste adhesive tape over crack and paint black. Right—Fig. 2. This photo shows what happens when you get the lens reversed in your camera. Edge of the picture is blurred, while the images in center are sharply defined.

Fig. 3. Here is the best way to examine bellows of your camera for cracks or pinholes. A 60-watt light will suffice.

# and What To Do About It

*by*

**KENNETH MURRAY**

Fig. 4. Crazy light streaks on your finished picture may be traced to a pinhole in bellows of your camera. Right—Fogging of edges of picture occurs when back of camera is loose, admitting a minute quantity of light into the box.

Fig. 5. To test camera back for true edges, lay it on flat surface and use a flashlight.

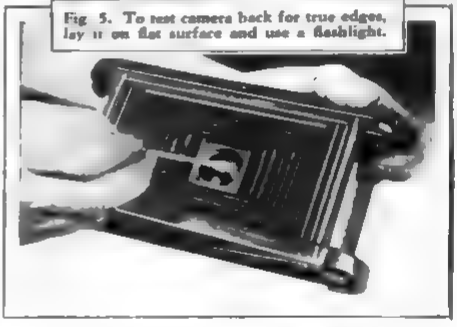


Fig. 6. Making of clean sharp pictures requires first and foremost that you keep lens clean. Wad of cotton on end of toothpick will easily keep the glass bright and shiny.

judge light correctly; an exposure meter is inexpensive and always right.

Finally, underexposed negatives (on which the image is "thin") will give vastly better results if you ask your finisher to print them on "hard" printing paper. Ordinarily he may not take the trouble to do this, so it is a point to remember.

### Cause and Remedy for Fogging

Are any of your negatives fogged or light streaked, like those in Figs. 1 and 4? A pinhole in the bellows of a folding camera caused Fig. 4 failure, while the bellows had a small crack in it when No. 1 was taken.

You can easily fix it yourself. Remove the camera back, hold it up to a light as demonstrated in Fig. 3 and locate the hole. Then cover it with a bit of adhesive tape on the inside and paint the patch with black India ink.

The photo in Fig. 8 would have been a very good picture, but the negative was scratched, the cause of the black lines. Remedy: smooth down the rollers over which the film passes with a bit of emery cloth as illustrated in Fig. 7. Then look for other places that might cause scratches. A bit of paint cracked off might do it. See that the rollers revolve freely.

### Camera Back Should Fit Tightly

Fig. 4 (right) shows another kind of fog caused when the back of the camera does not fit tightly. Place the back on a level surface and with a flashlight (as in Fig. 5) hunt for an uneven spot. You can bend the back straight with your hands so that it will lay perfectly flat. If an edge is bent out of line in one spot, straighten it with pliers. Look for other places where light might enter.

Prints may be blurred as in Fig. 12 for two reasons. The shutter may have stuck slightly, making it work too slow, or the setting may have accidentally become moved to "bulb" instead of "instantaneous."

In the former case, lubricate the shutter leaves by rubbing them with a soft lead pencil. The small trace of graphite is sufficient lubrication. Never use oil. If this will not help, take the camera to an expert and have the shutter cleaned or adjusted, or both.

Should the negatives ever turn out perfectly blank examine the shutter to see that it is working. Many times, too, I have found that the strip of gummed paper from around the roll film will fall

Fig. 7. Best method to prevent scratching of negatives, causing pictures to turn out as in Fig. 8 at the right, is to smooth down the rollers over which the film passes with a small piece of emery cloth. Also make sure that the rollers revolve freely. Cracked paint is also responsible for the scratches.

Fig. 8. Black lines in the picture above were caused by rough rollers. A remedy for this is given in Fig. 7.

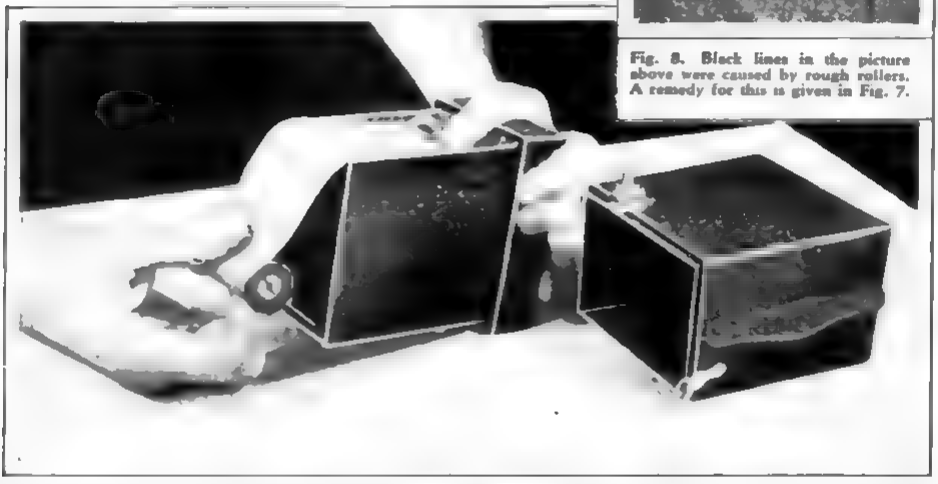


Fig. 9. Here is the correct way to insert a film in your box camera. First, wind the end of the film on the empty spool, then unwind the unexposed film, laying it over the rollers, and finally securing it in place on other side of the box.

inside the camera and effectively cover the lens.

Fig. 2 shows a print in which only the center is sharp, the remainder blurred. The trouble was caused when the lens was removed for cleaning and not returned to its mount correctly. The convex side of single lenses should face the inside of the camera. Pass a match stick over the lens surface and you can tell if it is convex (bulging out) or not.

A dirty lens robs pictures of snap and brilliance. Clean the lens frequently. I use a bit of cotton on the end of a medical "swab" stick so that the lens does not have to be removed. If strands of cotton adhere to the shutter remove them with the moistened end of another stick.

Sometimes the view-finder does not show the same view that reaches the film. Remove the back from the camera, substitute a sheet of ground glass or tissue paper, as illustrated in Fig. 13, and compare the results, with the lens open, with what the finder shows. If the finder shows too much, compared to the angle of view taken in by the lens, block out part of the finder with black paint.

This will prevent the frequently seen pictures in which the subject is half in and half out of the picture.

Speaking of view finders, you can easily make the one shown in Fig. 10 with a sheet of cardboard, which is held over the camera front. The correct position for the cheek bone against the back of the camera can easily be located and marked, and then it will be easy to "shoot" from eye level with certainty that everything seen through the aperture will be included on the negative.

In Fig. 11 a card, black on one side, is

used to take time exposures. The little hole in the center is drawn across the lens opening, fast or slow, as necessary, giving an even exposure without difficulty.

The great advantage of this stunt is that there is no vibration, as is the case when a time exposure is taken with the regular trigger. Merely open the shutter with the card covering the lens.

All kinds of trouble may result if the film is not wound evenly in the camera. For this reason you will find it better to thread up the film with the unexposed roll held in the hand, inserting it in place last as shown in Fig. 9.

The following few picture-taking tips will aid in making better pictures. They are extremely simple. For instance, thread up a new roll of film in the camera but do not wind it in place until ready to take the first picture. This will protect the film from the air, which is deleterious. After a roll is exposed give the winding key a dozen extra turns. They will tighten up the roll and reduce chances of light fog when you remove the film.

### Proper Care of Camera Essential

In loading a small folding camera, like the vest pocket size, be careful not to leave finger prints on the lens. This is commonly done, as the lens is exposed near the fingers and easily smeared. Dust out the inside of the camera, especially the bellows folds, several times a year. Dust settling on the film will cause black spots on the prints.

In the beginning of this article we mentioned cracks and pinholes in the bellows. During the manufacturing process the bellows leather loses all of its natural oil and it is the dryness, more than the wear, that causes cracks. The remedy: apply neatsfoot oil lightly to the outside with a wad of cotton until the leather becomes soft and pliable. Wipe off the surplus. A practically crackproof bellows is the result.

In conclusion, I think that if you will compare the sample failures illustrated herewith you will quickly find your camera's weaknesses.

Fig. 10. A sheet of cardboard, cut out as shown here, makes accurate view finder for shooting from eye level.

Fig. 11. Making time exposures with box camera is easily and accurately done with cardboard square shown above. It is drawn across lens slowly, depending upon length of exposure.

Fig. 12. Blurring of images in picture as shown above may be caused by sluggish shutter, which should be lubricated occasionally by graphite from pencil. Never use oil.

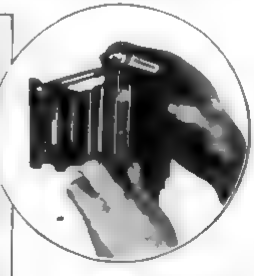
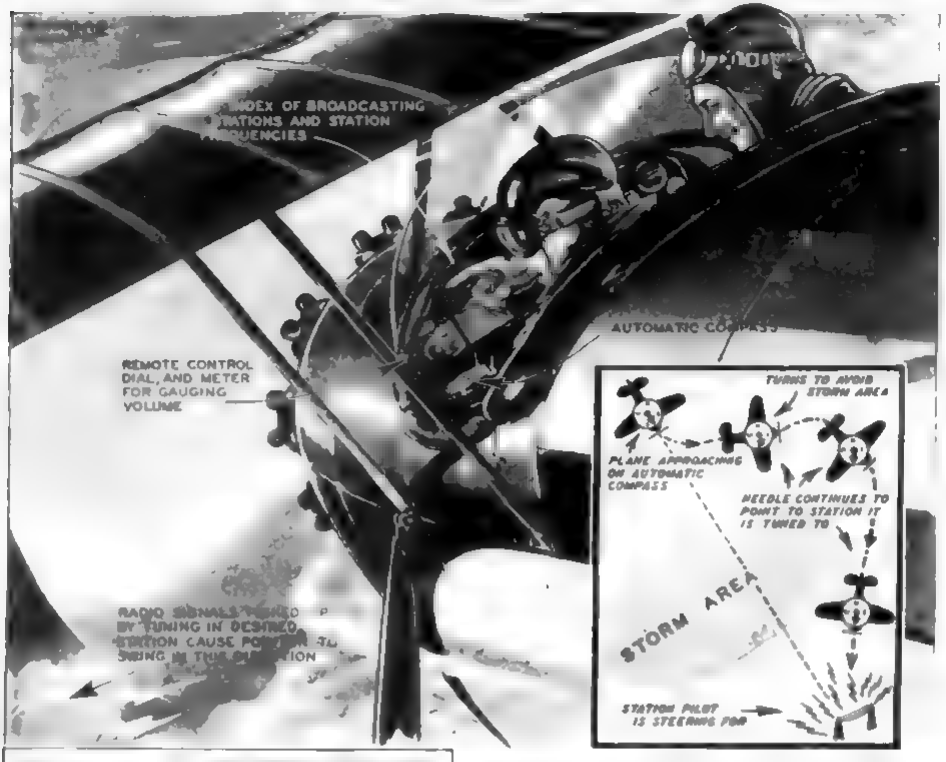
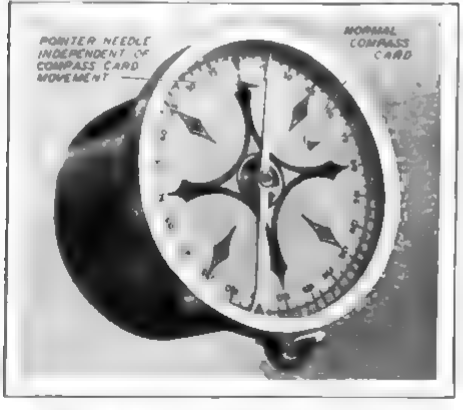


Fig. 13. To check up on your view finder, remove back from camera and substitute piece of ground glass. Then compare view on glass with view in the regular view finder. If too much of scene shows in latter, block out part of the finder with black paint.

# Radio Compass Makes Blind Flying Safe




The automatic compass is installed in plane as illustrated here. Insert illustrates how pilots steer course around storm area, while following needle of the radio compass.




This photo of the new automatic radio compass shows the pointer needle which, operated by the directional radio receiver, points always toward the received broadcast station.

EMERGING from the secrecy of several months of intensive experimental work, Warren S. Eaton, pioneer aeronautical engineer, recently announced the invention of a new automatic compass which bids fair to usurp the functions of the principal navigating instruments now in use.

The instrument is primarily a radio receiver, automatically operated, but appearing similar to the familiar aviation compass, as the accompanying photo shows. With the use of the device, the inventor claims, it is possible to take off, make a flight of any duration, and land, flying totally blind during the entire period.

Operation of the instrument is very simple. The station in the direction desired is tuned in on the remote control dial, a meter indicating the proper tuning. During this tuning procedure the meter on the compass will swing to and remain in position pointing directly to the broadcast station coming in, regardless of the direction of flight or maneuvers of the plane.

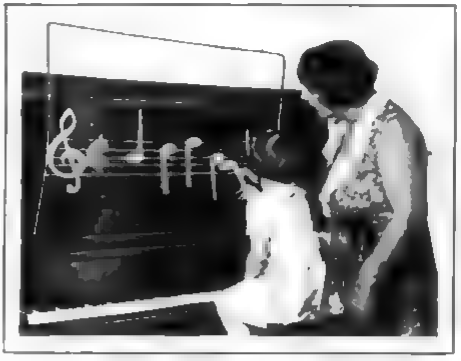
The compass enables the pilot to pick up a station and by following the indicator needle to maintain a straight flight path between two stations and compensate for drift at the same time. In case of a storm the pilot may circle the danger area, still maintaining his bearings and following the signals to his destination. The drawing above illustrates how the storm area is avoided.

# Music Lessons Depicted on Wire Clef Keep Pupil's Interest

PRIMARY pupils have usually found the task of mastering the fundamentals of music a rather dull, dead job. That is, until a teacher conceived the idea of presenting the elementary lessons in a graphic manner, as shown on the right, to keep the child's interest and speed up learning.

The "game" consists of a wire frame made from discarded wire coat hangers. Across this frame is run two sets of string or wire, forming two musical clefs.

Notes are made of cardboard with hooks pasted on the back so they may be hung in position on the staff to demonstrate the instructor's lessons.



Ten wires are strung across the frame forming upper and lower musical clefs. The notes are made of cardboard and hooks pasted on their backs allow them to be hung in place.

## Paper Vest Keeps Out the Cold

ALTHOUGH people have known for a long time that paper will keep out the wind and draft, it has not been until recently that successful efforts have been carried out to make clothing from it.

This vest is made of paper and will keep out wind and cold.

The man on the left is wearing a vest made of specially prepared paper. It is tough and warm, is fastened by snaps, and is intended to be worn under regular garments in place of cloth vest or sweater. Tough fibre of the paper will not tear.

## Sofa Made From Auto Cushions

A SOFA large enough for three people to sit in can be made from the cushions, upholstery and padding of a wrecked car.

The rear seat cushion is used intact, while the front ones are taken apart and the material used to stuff and cover the arms. A two-tone effect is gained by covering the front ends and back with a plain material. Legs are fashioned from lumber and secured in place by bolts. The finished product is shown below.

The above sofa is large enough to accommodate three persons comfortably and is made from cushions of wrecked car.

## No Hunting for This Tube Cap

A RUBBER cap has been developed recently for sealing tooth paste and other collapsible tubes. The outstanding feature of this cap is that it cannot be lost or dropped. As the photo on the right shows, the device is all one piece and is used in place of the regular top.

The lower ring, which is slightly elastic, is slipped over the tube after the original stopper has been removed. The new cap is then pulled down over the vent and is held in place by suction. It is always on the tube and can be removed or replaced more easily than the threaded type. The same cap can be used repeatedly.

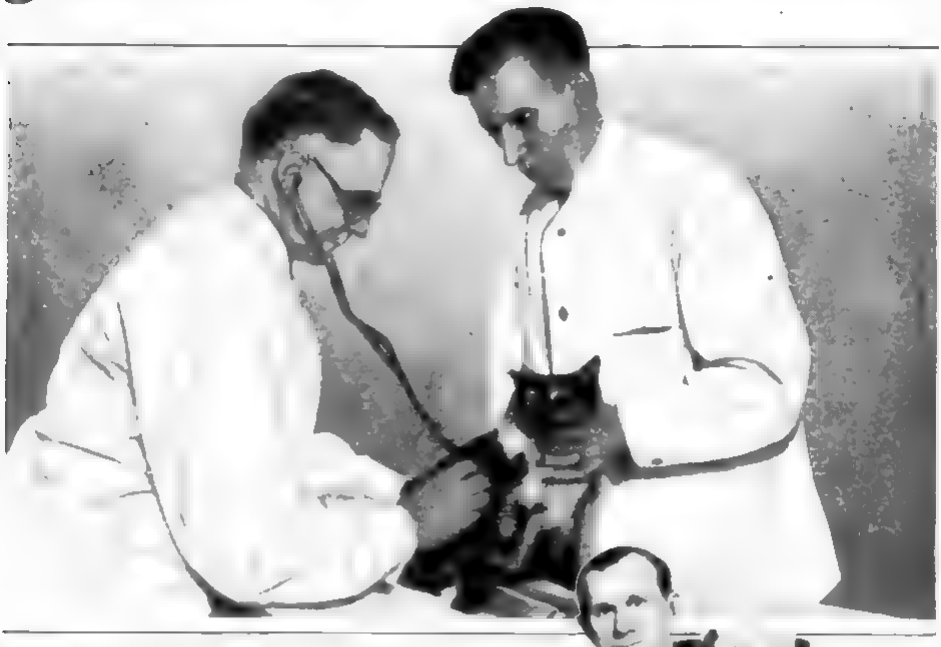
Rubber ring slips down over the tube holding new cap so that it cannot be misplaced.

## Destroy Blight With Poison Gas

A GOOD way to destroy green fly and similar blight on plants is by utilizing the gas which is generated when carbide is moistened. Put some carbide in a canister, the lids of which have been perforated, and fasten this on a bough of the infected tree before a rain.

The water passing through the holes causes the generation of the gas which is deadly to green fly and insects. In dry weather the carbide can be moistened by sprinkling water over the canister lid.

# SCIENTIFIC Treatment



Veterinarians at the Ellin Speyer hospital in New York City are here seen testing tabby's heart with the stethoscope in examination for treatment. Hailing from the alley, she gets as good treatment as if she were an aristocrat of catdom.

WHETHER he is a downcast back-yard mongrel, sniffing pathetically at the ghetto air of the East Side, or whether he graces a special post in milady's limousine, tilting his nose arrogantly at the breezes on the Avenue, every dog has his chance at the Ellin Speyer Hospital for Animals in New York City.

Founded twenty years ago by Mrs. James Speyer, a New York society woman whose love for dumb animals was boundless, the hospital has grown to be one of the largest institutions of its kind in the world. Its development has followed along scientific lines and its success is embodied in the contributions which the mechanical mind has provided.

### Inventors Alleviate Animal Suffering

For instance, inventors have been at work steadily in connection with the animal hospital and have made many instruments and pieces of apparatus which have proved life-savers for suffering creatures. The general organization of the hospital and the method of treatment now approaches systems employed in institutions for human beings.

Nearly $500,000 is now invested in this haven for lost, stray or stricken animals. It is a large four-story brick structure with "maternity" wards, admission ward, operating rooms and convalescent wards.

A maternity ward is one of the features of the Speyer Animal Hospital. Here is a fond mama with two of her recently acquired offspring. Infant mortality rate at Speyer hospital is low, thanks to the scientific care given pups.

During the year of 1929, the Speyer Hospital treated 17,021 patients. Dogs, as always, led the patients in number, 10,910 being treated in the Clinic and 4,257 being received in the various wards. Cats came next, then horses, and the remaining 86 included goats, parrots and two Abyssinian servals, which look like young tigers.

There was also a skunk, said by its

# Reduces ANIMAL Suffering

owner to be a harmless and affectionate pet. But he didn't go over so big with the other inmates.

### Dog Eats Hardware—Gets Indigestion

There was a young police dog who occupied a cage for several weeks in the surgical ward not so long ago. An urchin who had found the dog wandering mournfully about in the street presented him at the Clinic with the comment that the hound had indigestion.

The lad's diagnosis hit the nail right on the head, observed the doctor a few moments later. For the police dog had swallowed fourteen iron stove bolts, seven tacks, and three ten-penny nails. "Too much spaghetti and too little meat—a badly balanced diet—had given the growing puppy the rickets and caused a craving which was lulled by the taste of iron," explained the attending surgeon.

The records of this harbor for domestic animals in physical trouble show that canine victims of motor vehicles are increasing in number throughout the big city. The tables show that the zero hour for dogs is around midnight. The doctors on night duty report that it is a rare night when they are not called upon to care for many with broken backs, fractured legs and other injuries.

### Treatment Given for All Ailments

In going through the medical wards the visitor finds dogs laid up with pneumonia, laryngitis, asthma, distemper, usually brought on by too much bathing when dry cleaning would be safer. There one finds dogs suffering from eczema because of eating too much pork, ice cream or other fatal dainties. Dogs that are paralyzed or dropsical for lack of exercise.

Bruce Blair, veterinarian in charge at the Speyer Hospital, has been greatly responsible for the scientific and mechanical developments which have been of priceless value in the work of saving the lives of dumb animals.

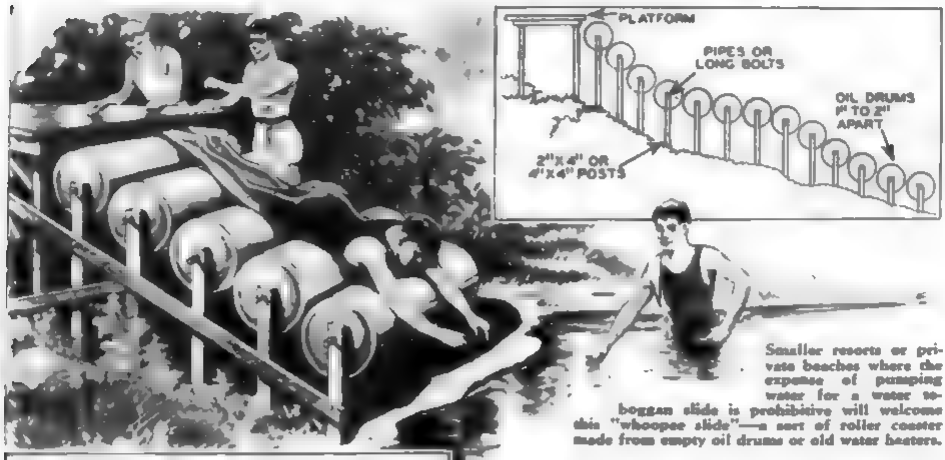
"The treatment of sick animals is today more than an exact science," he said, "and the hospital must keep up with scientific advancement. We are striving constantly to improve our medical and surgical treatment."

Many of the diseases of small animals, he explained, are similar to those of man and fortunately it is possible to pattern his work along the line of that done in human medicine and so benefit by their research.

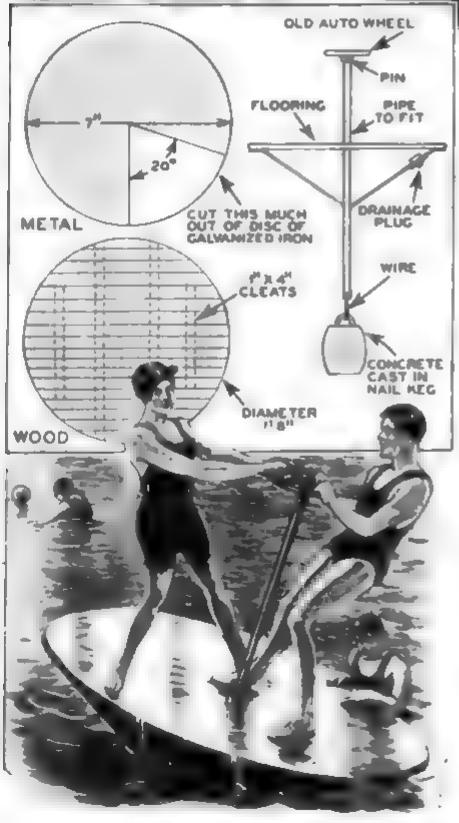
Suffering from indigestion, this young police dog was found to have swallowed numerous bolts, tacks and nails.

Youngsters in New York are urged to bring their ailing dog companions to the Speyer Hospital for treatment. Photo at right shows veterinarians applying splint to canine who has been injured by auto. Animals are given tenderest treatment.

# These Gadgets Add FUN to




Smaller resorts or private beaches where the expense of pumping water for a water toboggan slide is prohibitive will welcome this "whoopee slide"—a sort of roller coaster made from empty oil drums or old water heaters.




The water spinner is great fun for any number of swimmers up to half a dozen. It is simple to construct from above diagrams. The wooden support at the top of the cone should be carefully sanded down to remove splinters.

SOME of us still thrill to the delights of the old swimming hole; others don't admit it. There was the clay bank, for instance, which was soaked with water and then used for sliding purposes. An occasional protruding twig was a minor incident, even if it did scratch deep. The grape vine swing had a glamor all its own —except when it broke.

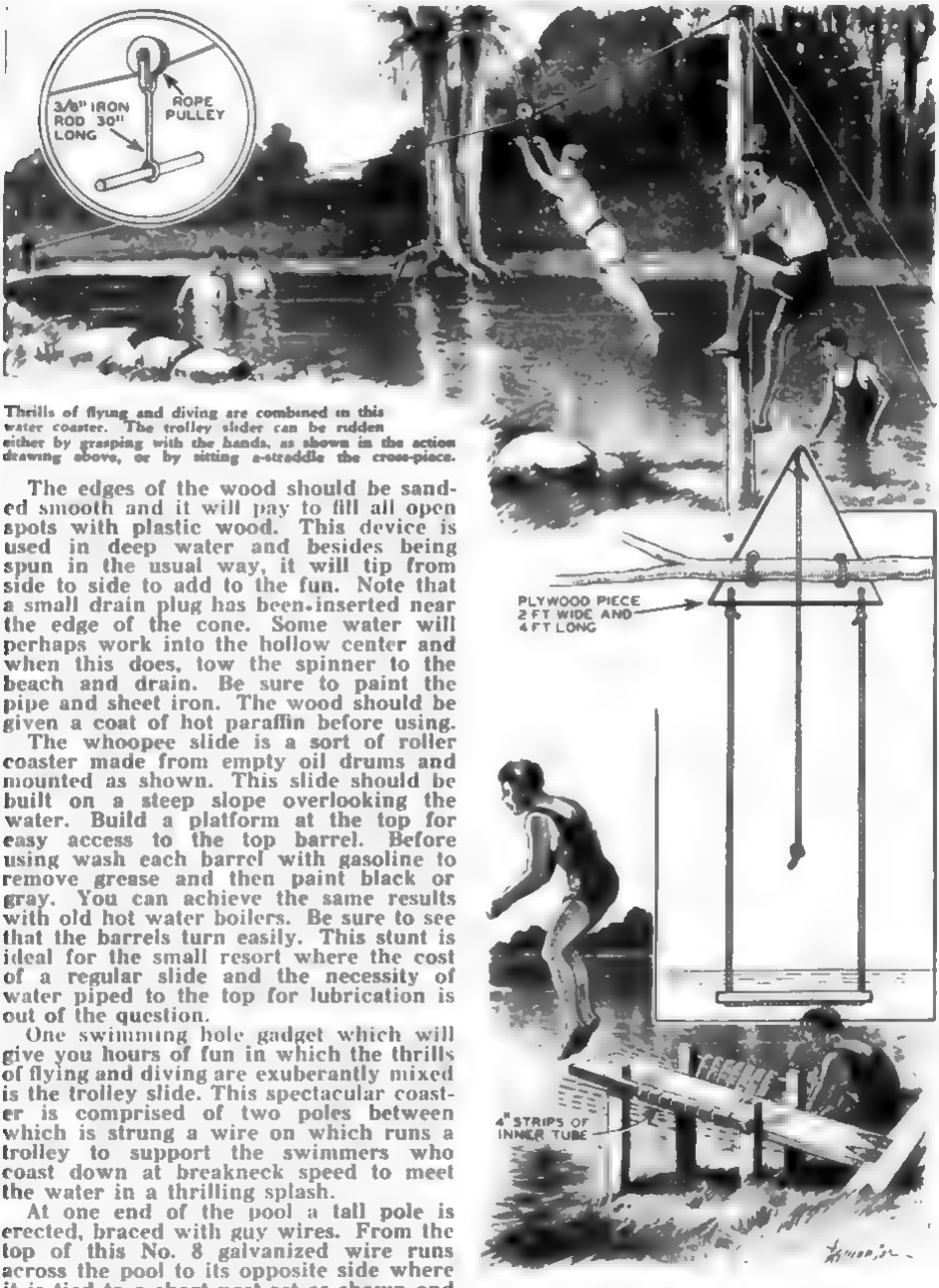
Here are a few stunts that you can use around your favorite swimming hole—stunts which will increase the delights of old-fashioned swimming. For that matter, the ideas are just as appropriate for the modern beach or pool, conditions permitting.

A certain mid-western sand pit, always full of cool, clear water, is the rendezvous of water sports fans in that community. One of the good devices used here is the water spinner, shown in an accompanying drawing. It is simply made.

You will need a soldered-up disc of galvanized iron—rather heavy gauge—7 feet in diameter, a built-up disc of matched boards properly cleated underneath, 7 feet, 8 inches in diameter; an old auto steering wheel; an 8 or 9-foot length of gas pipe to fit this wheel's center; and a small batch of concrete. Cut the portion shown from the sheet metal disc and solder the lapped edge to make the shallow cone.

Nail the edges to the under side of the wooden top with strips of rubber between wood and metal to seal the joint. Then run the pipe as shown down through the center and build up a good solder joint at the inverted apex of the cone. You can also run a long pin through the pipe just above the wood to further support the pipe. Hang the concrete weight cast as shown to the bottom of the pipe and put the auto steering wheel on the top.

# SWIMMING HOLE SPORTS




Thrills of flying and diving are combined in this water coaster. The trolley slider can be ridden either by grasping with the hands, as shown in the action drawing above, or by sitting a-straddle the cross-piece.

The edges of the wood should be sanded smooth and it will pay to fill all open spots with plastic wood. This device is used in deep water and besides being spun in the usual way, it will tip from side to side to add to the fun. Note that a small drain plug has been inserted near the edge of the cone. Some water will perhaps work into the hollow center and when this does, tow the spinner to the beach and drain. Be sure to paint the pipe and sheet iron. The wood should be given a coat of hot paraffin before using.

The whoopee slide is a sort of roller coaster made from empty oil drums and mounted as shown. This slide should be built on a steep slope overlooking the water. Build a platform at the top for easy access to the top barrel. Before using wash each barrel with gasoline to remove grease and then paint black or gray. You can achieve the same results with old hot water boilers. Be sure to see that the barrels turn easily. This stunt is ideal for the small resort where the cost of a regular slide and the necessity of water piped to the top for lubrication is out of the question.

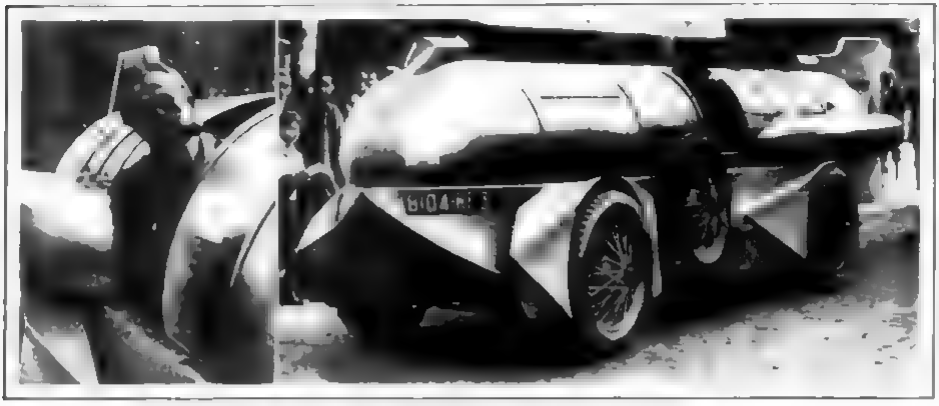
One swimming hole gadget which will give you hours of fun in which the thrills of flying and diving are exuberantly mixed is the trolley slide. This spectacular coaster is comprised of two poles between which is strung a wire on which runs a trolley to support the swimmers who coast down at breakneck speed to meet the water in a thrilling splash.

At one end of the pool a tall pole is erected, braced with guy wires. From the top of this No. 8 galvanized wire runs across the pool to its opposite side where it is tied to a short post set as shown and made rigid with sunken deadmen. Cleats

*(Continued on page 180)*

The water swing, shown in insert above, has its height above water controlled by rope attached to triangular board. Below—Inner tubes provide a snappy short springboard.

# Giant French Racing Car Out After New Speed Record



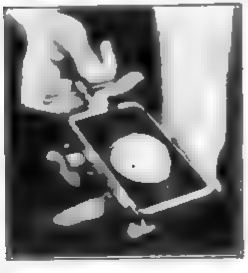
Equipped with three 800-horsepower Jupiter motors, this giant French racing car, shown at the right above, will soon be sent speeding down Daytona Beach in an attempt to set a new world's speed record. Left—M. Stapp, inventor.

AFTER spending two years on its construction, M. Stapp, French inventor and driver, has developed the giant racing car, shown at the top of the page, which he will bring to Daytona Beach in an attempt to eclipse the present world's speed record of 253 miles an hour now held by Sir Malcolm Campbell, British ace.

The new racer is built in the shape of a huge streamlined rocket. A stabilizing fin is attached to the rear of the car to aid in keeping the vehicle on a steady course when going at top speed. Cylindrical exhaust chambers are above rear wheels.

Constructed chiefly of French-made materials, the car is powered by three 800-horsepower Jupiter motors. A 60-horsepower Voisin motor is used to start the three engines spinning. In recent testings, the motors are reported to have done 22,000 revolutions per minute.

## Marker Prints Name on Golf Balls



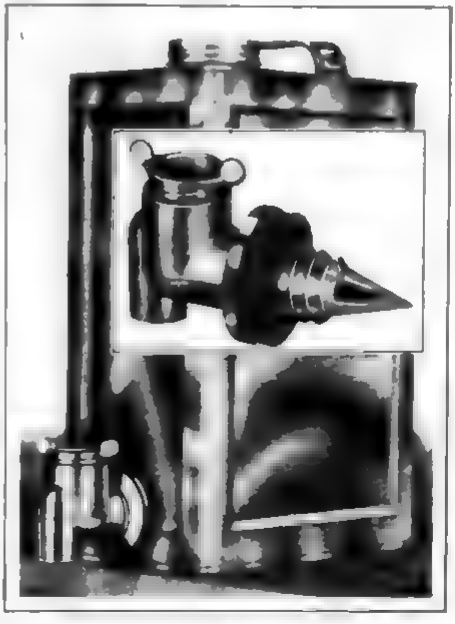
When ball is placed in marker, inked name die is pressed into the ball by turning screw.

CUT down your number of lost golf balls by marking them with your name or initials. The finder will see at a glance who lost the balls and many will be returned.

The marker is intended for family use and the names or initials are cast on a metal die which is placed in device. An inking attachment is self-contained and impression is made by turning screw which presses marker into surface.

## Dispensing Spigot for Containers

THE inconvenience of lifting and tilting a metal container to pour out its contents is eliminated with the use of a dispensing spigot now being marketed. The sharp end of the device, shown below, is punched into the lower part of the can. A coarse thread draws the cork washer up tight against the container, making a joint which does not leak. Liquid is drawn from faucet by turning top disc.



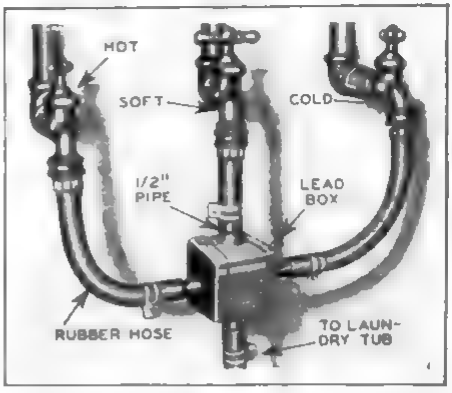
Dispenser spigot is pushed into lower part of container and screwed tight to metal wall. Works like simple faucet.

# Lead Box Mixes Hot, Cold and Soft Water for Laundry

WHEN drawing water in the basement laundry, it is convenient to have a "mixer" so that hot, cold and soft water can be all drawn from one spout.

The "mixer" at the right is made by first building a wooden box 4″ square. Then construct a cardboard box 3″ square and fasten it in the wooden box so that it has a ½-inch clearance all around. Fill the mold with molten lead, and when metal has cooled down, remove the wooden box.

Drill ½-inch holes in the top, bottom and two sides. The charred cardboard can be removed through these. Then to each hole solder a 2″ length of ½-inch pipe. Three of these are connected to the hot, cold and soft water faucets, respectively. The lower pipe is the outlet.



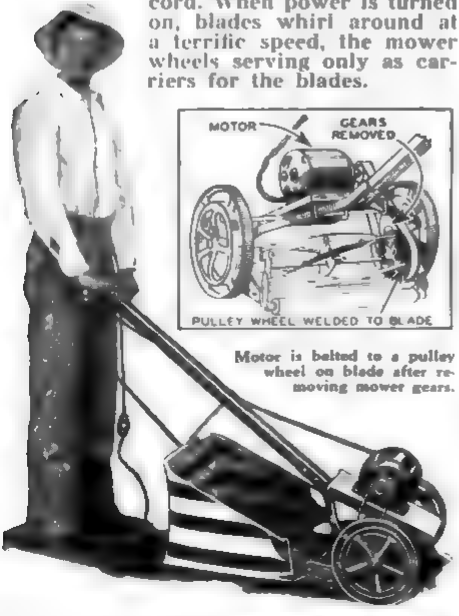

Showing complete hook-up of three-faucet water "mixer."

## Small Motor Powers Lawn Mower

MAKING an efficient electrically-powered cutter out of your lawn mower will save you a lot of energy during the coming "mowing" season.

After removing the ratchets from the mower, bolt a wood block, measuring 11″ x 7″ x 2″, on the frame rod and mower handle, as shown below, and mount a ¼-horsepower motor on the block. A flat pulley taken from the fan for a Model "T" Ford is brazed on the end of the blade wheel and connected with an old fan belt to a 2½″ fiber pulley fitted on the motor.

The motor is connected to the nearest house socket by an extension cord. When power is turned on, blades whirl around at a terrific speed, the mower wheels serving only as carriers for the blades.




Motor is belted to a pulley wheel on blade after removing mower gears.

Motor is mounted on a board bolted to the mower frame and connected with an extension cord to a house light socket.

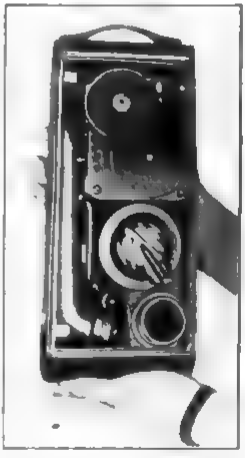
## Carbon Dioxide Heats the Earth

DR. E. O. HULBURT, physicist of the naval research laboratory, Washington, has found conclusive mathematical evidence that the earth's temperature is being warmed by the increased amount of carbon dioxide present in the air. Smoke stacks emit huge volumes of this gas, which is also found in the breath and waste products of humans and animals.

## World's Smallest Talking Machine

HERE is a portable talking machine that is thoroughly "portable." Reputed to be the world's smallest, the miniature, shown on the right, is constructed of steel and leather, and looks like a folding camera.

The horn is carried inside the machine and the same screw that is used for fixing the record to the plate is used in closing the apparatus. It weighs slightly over three pounds and fits in a coat pocket.



World's smallest talking machine fits in a folding camera.

## Nerve Fibers Fed by Parent Cell

NERVES are kept alive and in working order by a chemical which filters out slowly over the nerve fibers from the parent nerve cell. When cut off from its parent cell, by accident or operation, the nerve fiber slowly withers and dies.

# Autos Make Circus Travel

It's an easy life for the ponies in a motorized circus. They have their own private conveyances, so there's no more walking to the lot from the railroad yards.

Automobiles may be efficient, but they can't replace the elephant when it comes to moving bogged wagons on a muddy lot, which forms the greatest transportation hazard.

Motorized circus carries these house cars, which performers use as dressing rooms and living quarters. Cars remain on the lot over night and move to next town in morning.

THE circus pays tribute to the advancement of mechanical transportation facilities. Its expansion has been continously linked with the development of better modes of travel. Rapid movement of the circus caravan is its first requirement; next in line being the efficient handling of the great amount of show paraphernalia, animals and people.

In its earliest days, the circus was a wagon show, appropriately nicknamed a "mud show", creeping along the highways from town to town in primitive fashion—fighting wind and rain, mud and dust, for its meager existence. In that era, performers slept on bunks in the wagons that rumbled over the roads through the wee hours of night, while drivers and workmen snatched bits of rest during the day.

Railroad transportation brought about many changes in the circus. One ring shows became two, three and finally five ring circuses, menageries were enlarged, territory was extended and longer jumps were made.

Vying for supremacy, the circuses continued to expand until 1922, when the largest circus of all time went out on 100 cars of 60-foot length.

Time and science have wrought amazing changes in the circus world. The last of the existing wagon shows and all of the five and ten car railroad shows have changed their mode of travel and are now using motor vehicles. Large trucks carry the tents and equipment, trailers and semi-trailers are used for animals, and performers travel in house cars, which are utilized for sleeping quarters and dressing rooms.

# COMFORTABLE *and Speedy*

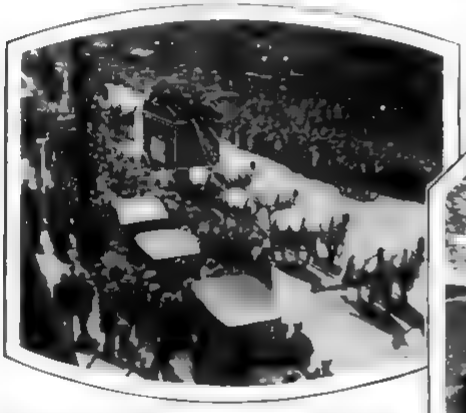
The motorized circus has its advantages. As fast as one truck is loaded, it may move on to the next town and no time is required for loading and unloading wagons from railroad cars.

The largest motorized shows today consist of as many as 75 trucks and trailers, together with passenger cars and private house cars. These shows are equal to the average 10 and 15 car railroad shows and several are on a par with 20 car circuses.

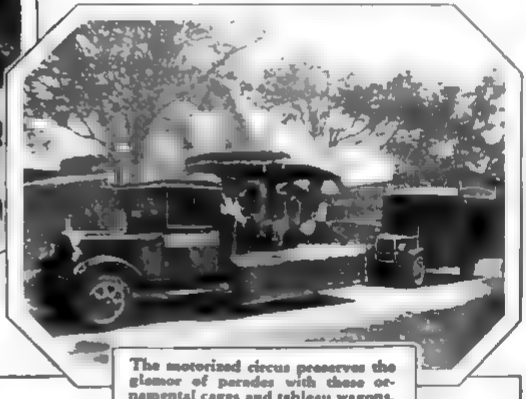
The motorized circus may soon reach its limit in growth. This development is presaged by legislation in some states to limit weight and dimensions of loaded trucks and trailers, while the larger a circus grows, the greater is the necessity for long jumps to play towns that assure adequate financial support. However, another development in transportation looms on the circus horizon –the combination of railroad and motorized equipment for moving a show.

This development has already been realized in part. For the first time last season, one of the large railroad circuses used motor trucks for the advertising department, billing the show two weeks ahead. In some instances, it was possible to bill two towns in a single day without the handicap of moving on railroad schedules and sudden route changes did not disrupt the billing department.

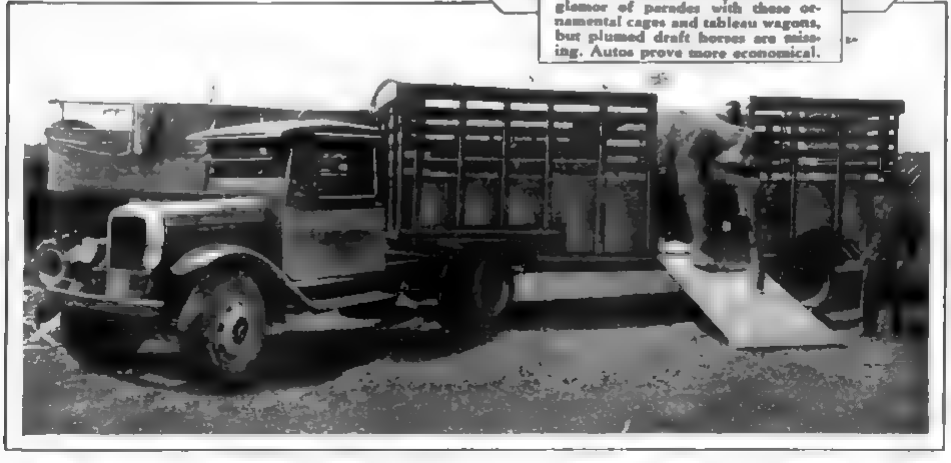
The combination show already has the stamp of approval from many veteran showmen experienced in both railroad and motorized circus transportation. They predict the use of railroad facilities for transporting officials, performers and the heavier animals, while motor trucks will convey tents, seats, and properties from town to town.



The time-honored horse parade has been discarded by present day circuses, traffic complexities in the larger cities having dealt the death blow to the glittering street spectacle.



The motorized circus preserves the glamor of parades with these ornamental cages and tableau wagons, but plumed draft horses are missing. Autos prove more economical.



In wagon show days, the elephants walked from town to town. Now the motorized circus carries its pachyderms by truck.

# Body Capacity Operates Door Opening, Closing Device

Mechanism attached to the door opens and closes it automatically, being operated by the body capacity switch.

PROF. LEON THEREMIN, inventor of the electric cello, has recently patented a new device which opens and closes doors automatically, and without the use of photo-electric cells. The attachment, shown installed in the photo on the left, consists of a door opening mechanism attached to the top of the door, which is controlled by a switch operated by body capacity.

Unlike other automatic doors, one operated by the new device will not close until the person is entirely out of the door. The door can never hit anyone accidentally, because it will always stop four inches away from the body, regardless of where you are standing in the doorway.

## 'Hydrophobia Skunk' a Fake Myth

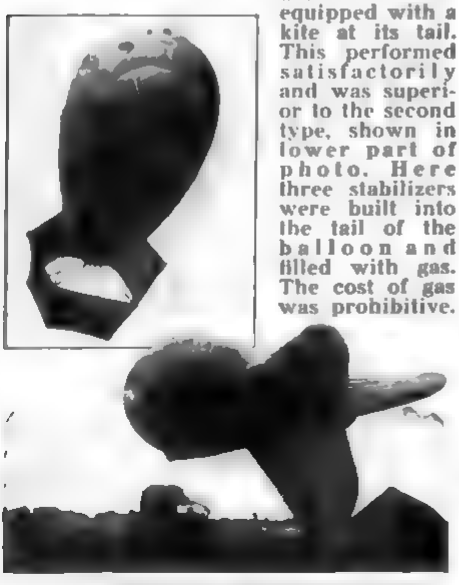
THE dreaded "hydrophobia skunk" of the southwestern states is both an affectionate pet and a valuable helper in keeping down field mice, insects and other harmful creatures.

This animal does his hunting mostly at night, and being friendly and fearless, often wanders into mountain camps, hence the myth about it being a disease carrier.

It is conceivable that they may contract hydrophobia in rare instances, but diligent inquiry has failed to disclose a single individual who contracted the disease from this animal.

## Stabilizers for Captive Balloons

GERMAN inventors have developed two types of stabilizers in an effort to reduce the difficulty of holding even captive balloons in the right direction. One balloon was equipped with a kite at its tail. This performed satisfactorily and was superior to the second type, shown in lower part of photo. Here three stabilizers were built into the tail of the balloon and filled with gas. The cost of gas was prohibitive.



Above are shown the two types of stabilizers developed to aid in keeping captive balloons in their right direction.

## Home-made Unit for Drying Films

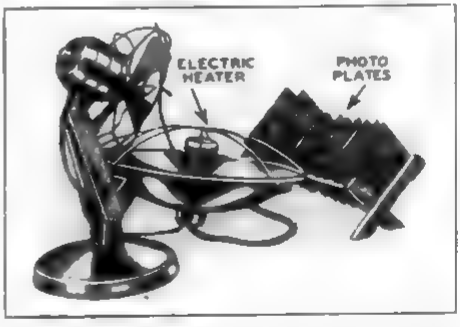



Photo plates are dried quickly by breeze which is warmed when fan blows air through an electrical heating element.

AMATEUR photographers who do their own developing will find the home-made dryer shown in the photo below a very handy apparatus to dry plates, films or prints. It can be made at a small cost from a portable electric heater and a small electric fan.

When set up in the order shown above, with the breeze from the fan deflected from the heating element towards the drying rack, plates will be completely dried in five minutes, without blistering, and prints will drop off the boards in the same length of time.

# PLANE TALK

Edited by DOUGLAS ROLFE

## Tilting Motor Mount Boosts Plane Speeds

FROM England, home of the world's fastest seaplane, comes news of a tilting engine mount invention for racing planes which is expected to increase the astonishing speed of 407.5 miles an hour attained by the British Schneider trophy racers last fall.

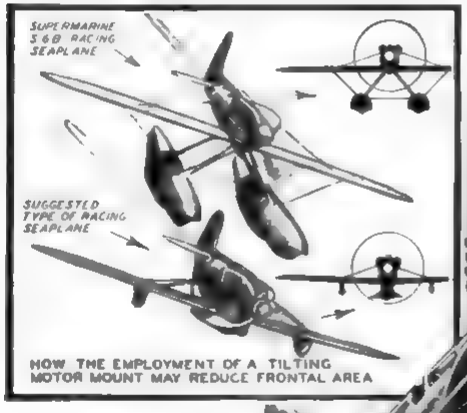
In experiments being conducted in London, the engine is mounted on a pivot which permits it and its propeller to be tilted upward at practically any desired angle within a range of 45 degrees.

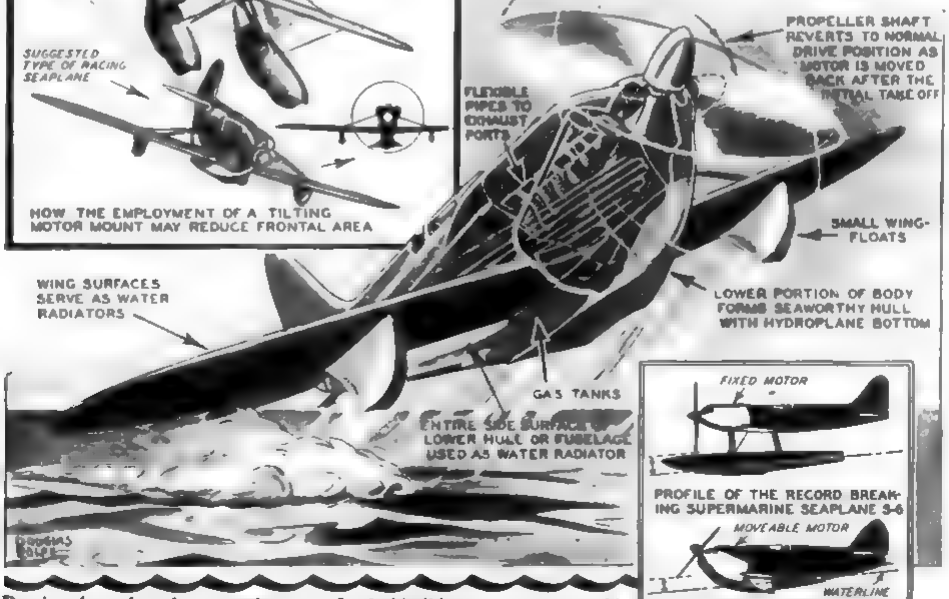
The principal advantage here is the water clearance afforded by the tilted propeller, making it unnecessary to provide large pontoons on an extended undercarriage to keep the blade tips from striking the water.

In fact, with the tilted engine mount the under-carriage can practically be eliminated so that the wing of the airplane almost rests on the water. This does away with considerable weight and frontal resistance. The device will be adapted to a plane having its entire under-fuselage fashioned in the form of a float, with small floats under each wing tip to maintain stability.

The saving in parasite resistance arrived at by dispensing with the twin floats, the float strut gear and bracing wires, would be partially offset by the need for a deeper fuselage to house the tilting engine. Additional resistance would also be encountered from the central fuselage-float sponsons and the small wing floats.

Another objection which the British experimenters must eliminate is the interference with the lifting power of the wing by the presence of the small floats on its under surface. Since wing loadings of raceplanes are extremely high (43 pounds per square foot of surface in the case of Schneider racers) any interference with this capacity would call for careful consideration.




Drawing above shows how a seaplane racer fitted with tilting motor mount would look in action. Note the absence of conventional twin pontoons—the plane is practically a floating wing, possible because tilting propeller clears the water.

# Electric FOG EYE Picks Up

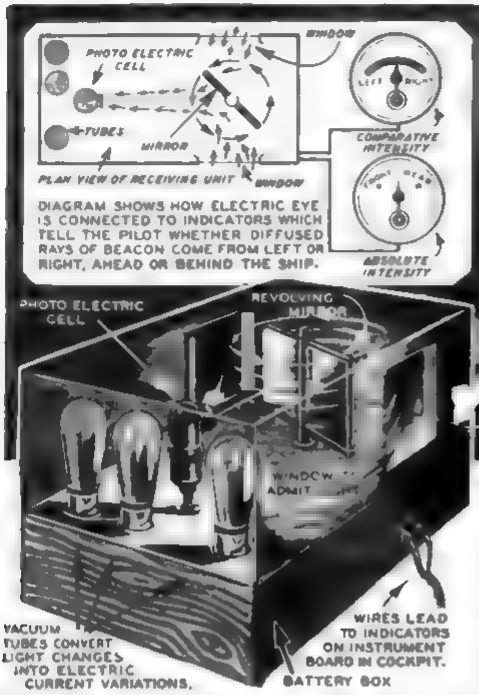



Fig. 1. Light beams from the beacon enter the electric fog eye through openings illustrated above and are reflected to the photo electric eye by the revolving mirror. Amplified current is measured by meters as shown in drawing at top.

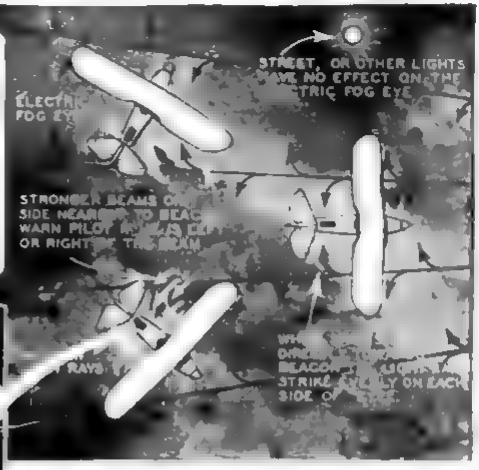



Fig. 2. Pilots entering the fog area get signal from electric eye that beacon is to right or left and then maneuver to course where meter shows that light is straight ahead.

ONE of the greatest dangers to the airman is fog, but unfortunately it has been the one which has taken longest to conquer. Jimmy Doolittle spent a year with fog flying experiments and was able, with his superior flying skill, to take off, fly in a circle and land blind.

Doolittle's experiments were a step in the right direction but did not make fog flying practical for the every-day pilot. To be practical, any device, instrument, or system of fog flying must be capable of being used without much preliminary training or study by the average pilot. The electric fog eye seems to fill the bill.

### Beacon Beams Ineffective Against Fog

Contrary to general opinion a searchlight or beacon beam diffuses when it hits fog. The light rays deflect and reflect in all directions until it is practically impossible for the human eye to tell from which direction the light comes. Fig. 3 shows an airplane entering a fog area. The pilot sees the reflection of the light in the fog but can not locate the direction of the source.

If the pilot can get close enough to actually see the beacon, he has no trouble in landing his plane, but it is a hit and miss proposition when he relies upon the human eye alone.

The General Electric Company has brought out the electric eye as a solution of the problem. Fig. 1 shows the main features of the device. A cabinet contains a mirror which rotates at the rate of about 100 r.p.m. Light enters the cabinet from the two sides and is reflected from the mirror into a photo-electric cell, which is very sensitive to differences in the intensity of light. By using vacuum tubes in connection with the electric cell, the changes in light intensity are converted into variations of electric current.

### Installation of the "Fog Eye"

This cabinet is installed near the tail of the plane so as to have open areas with no struts, wings, wires or cables to interfere with the light entering the windows. The variations in electric current are conveyed through wires to instruments on the pilot's instrument board.

Two instruments indicate to the pilot comparative light intensities on the two sides of the plane or upon which side the source of light is located. The second gives the absolute intensity of the light or shows whether the plane is approaching or going away from the light source.

Fig. 2 shows a plane flying toward the beacon. An ordinary light, incandescent or arc, will have no effect upon the electric eye, for the photo-electric cell is so constructed that it responds only to a flickering neon light with a known frequency.

Thus in Fig. 2, although there may be an arc light in the offing, the electric eye

# Beacon through Heavy Mist

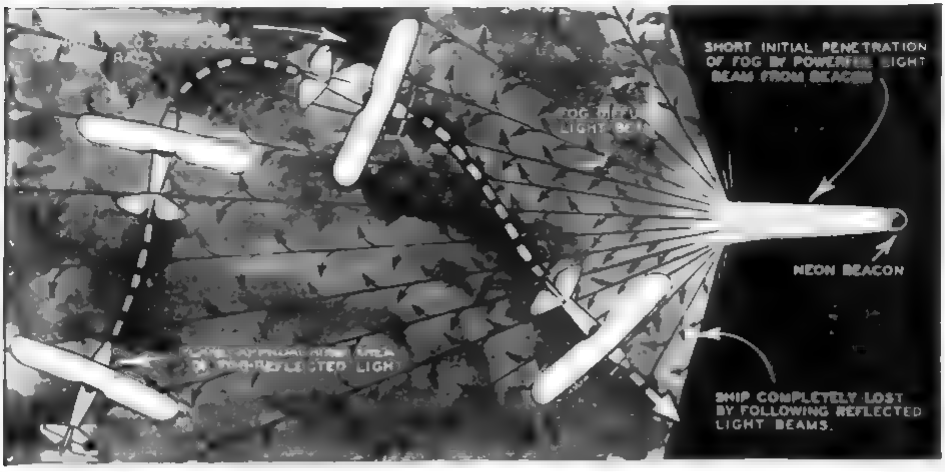



Fig. 3. Drawing above illustrates how pilots get lost in fog, which diffuses light rays from beacon on the ground.

will show that the plane has the same amount of light entering both cabinet windows, or in other words, the plane is headed toward the beacon.

When the plane reaches position at the top there will be more light entering the electric eye window from the side toward the beacon than the window on the other side. Thus the instrument will indicate to the pilot that the beacon is on his right.

If the plane in Fig. 2 is equipped with the electric eye, the pilot will know as soon as he enters the fog area that the beacon is to his right front or left rear. When he reaches the upper position he has been told by his instruments that the light is to his right and that he is getting closer. He then turns and the instruments indicate that the plane is pointing toward the beacon. He turns and arrives at the lower position when the photo-electric cell picks up more light from the left side than from the right, and then turns to the left and again heads toward the light.

## Stall Warning Device Sounds Buzz When Glider Reaches Danger Point

MOST glider pilots can feel a stall coming on, but those that are lacking in that form of sensitivity can get just as accurate and sure-fire a warning by ear from a new electric stall warning device recently developed by the Washington Glider Club of Washington, D. C.

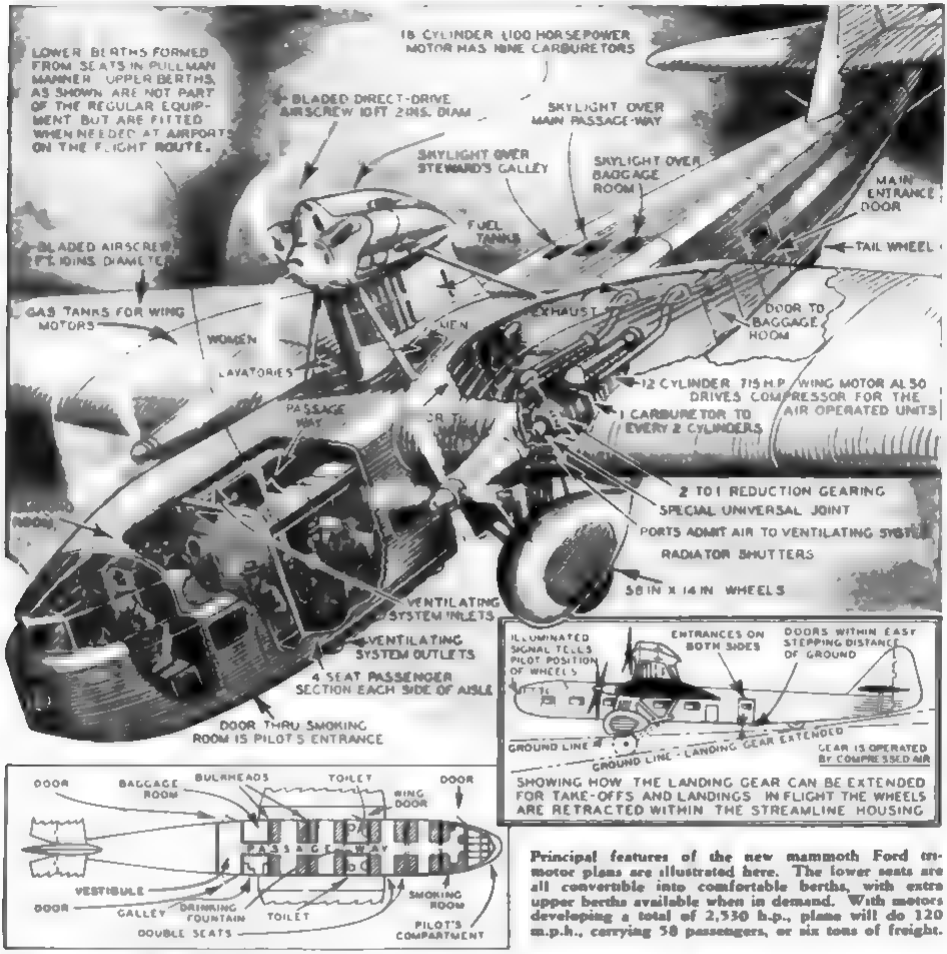
This warning device consists chiefly of a pressure disc, which faces into the wind as illustrated in the accompanying photo and drawing, a pair of silver contacts, a buzzer, and a flashlight battery.

When the glider reaches the danger point, the wind pressure on the disc is lessened to the degree that the tension spring can drive the center rod forward. When this action occurs, the silver contacts come together and close the circuit to the buzzer, thus sounding the alarm that the stalling point has been reached.

The adjustment of the tension spring is extremely critical, for it is this part of the device which determines the point at which the buzzer shall sound out. The entire mechanism is mounted atop the wing, just over the pilot as shown in the photo at the right. Device in no way hampers maneuvers of glider.

Stall-warning device is wired and installed as shown above.

# LARGEST U.S. AIR LINER Carries 58




**Principal features of the new mammoth Ford tri-motor plane are illustrated here. The lower seats are all convertible into comfortable berths, with extra upper berths available when in demand. With motors developing a total of 2,530 h.p., plane will do 120 m.p.h., carrying 58 passengers, or six tons of freight.**

REPRESENTING a radical departure from previous designs produced in this country, a new air liner recently completed by the airplane division of the Ford Motor Company has passenger accommodations as comfortable as the most luxurious Pullman car, and aero-dynamic and mechanical features of the greatest interest.

Three Hispano-Suiza engines power the giant ship, the largest commercial land plane in America. Two of them, developing 718 h.p. each, are built into the port and starboard wings, which have a maximum depth of 4 ft. 3 in., while the third, or center motor, is mounted on a nacelle high above the cabin, developing 1,100 h.p., giving a total of 2,530 h.p. to the giant plane.

A thermostatically-controlled heating and ventilating system is employed, the air being drawn through ports in the wing immediately behind the propellers. The indrawn air is heated by radiators coupled to the exhaust pipes and fed to the cabins by means of outlets above the central passage way. Ventilating outlets are arranged beneath the seats.

The main cabin is over 41 feet long, nearly 9 feet wide, and has a maximum height of 6 feet, 10 inches. For night travel, the lower seats of each passenger compartment can be converted into lower berths and provision is made for installing upper berths also, but these are not carried unless they are in actual demand.

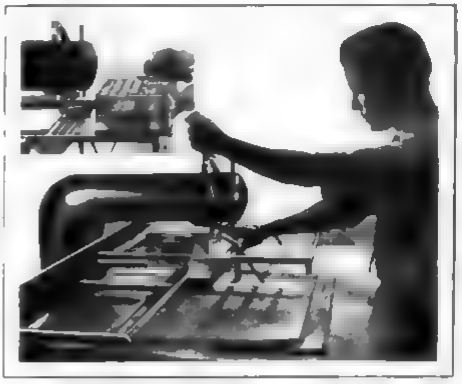
The plane is constructed chiefly from a new steel which combines unusually light weight and great strength. Semi-retractable landing gear is extended for the take-off, being drawn up when the ship is at rest, bringing cabin door close to ground.

# Show Card Machine Prints 1500 Two-color Signs Per Day

THE job of turning out 1500 two-color show card signs in one day would be a difficult task for four experienced card writers, yet one unskilled boy can do the trick with the new sign machine shown on the right.

Although a type cabinet is used, no knowledge of type-setting is necessary, as all the operator has to do when printing a card is to move his type case over the letter, figure or mark he wishes to print and pull the lever down. The case works on a typewriter-like carriage.

The machine will print two colors at one time and works on paper, cardboard, cloth or cellophane.



In printing the show card, the operator merely moves the type carriage back and forth to the letters, marks or figures desired and pulls down the lever. Machine prints two colors.

## New Sun Glasses for Outfielders

Sun glasses fasten to the cap and are always ready for use.

HERE is what the up and coming outfielders are going to wear this season. These trick sun glasses fasten on the visor of the cap so that the player can follow the ball's flight even when looking into the sun. There'll be no pop flies falling safe in the sun "gardens" when these glasses are used. They are fastened on with small screws.

## Radio Waves Penetrate Rock

THE fact that electromagnetic waves actually penetrate rock has been definitely established by a group of experiments recently conducted at Mammoth Cave, Kentucky. During the tests a radio receiving set was carried to positions distant from the mouth of the cave, tortuous passages being followed in the effort to locate the apparatus in positions most advantageous for the test.

The experiment was conducted with the frequencies used in commercial broadcasting. The clearness of the signals did not diminish as receiver was moved to places where signals could only be received through the overhead rocks.

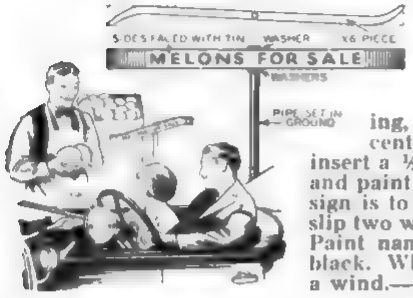
## Life Guard Speeds to Drowning Swimmer on Motorized Surfboard

SURFBOARD riders won't have to depend on outboard motors or speed boats to pull them over the water in the future. Below is shown a motorized surfboard scooter recently invented in Australia. The small motor in the rear furnishes the power and also sets the board at the proper angle in the water. A good machine for life guards.

Besides its use as a pleasure device, this motorized surfboard speeds life guards to drowning swimmers in minimum time.

# HANDIKINKS

**Handikinks department is just what the name implies. Each month on these pages you will find a number of simple projects that are easily carried out, and which will be found mighty useful around home, garden, garage or workshop.**

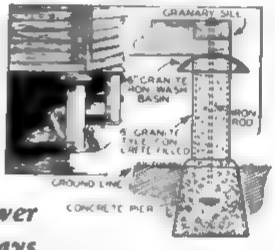



## *Turning Road Sign for Produce Growers*

IF YOU raise garden produce and sell it at the roadside, this turning sign will catch the eye of passing motorists and tell them your story. Lay out the sign, as illustrated in the top drawing, on a board 3″x6″x8′, making it 1″ thick at the center. Bore a hole through the hub lengthwise and insert a ½″ bolt. Then cover the sides with thin tin strips and paint white. Set a metal pipe in the ground where the sign is to be and fill the pit with cement. When still soft, slip two washers over the bolt and thread it into the cement. Paint names of your wares on both sides of the sign in black. When bearing is oiled, the sign will turn slowly in a wind.—Dale Van Horn.

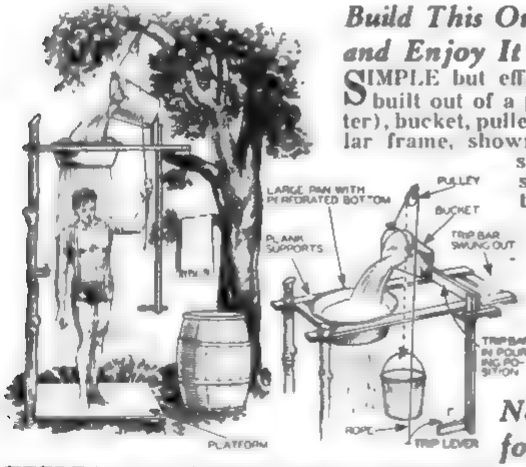
## *Simple Kink Keeps Rodents Out of Your Granary*

RODENTS won't be able to run up the support posts and get into your grains if you set your granary up on props like those shown at the right. They are built as the illustration on the right shows, with a 16″ granite basin inverted over the top of each glazed granite prop. Granary sill is bolted to rod embedded in footing.—N. R. Baker.




## *Build This Outdoor Shower and Enjoy It on Hot Days*

SIMPLE but effective shower bath equipment can be built out of a perforated dishpan (the larger the better), bucket, pulley, rope and a few boards. The rectangular frame, shown in the left hand diagram, made to support the dishpan and the trip bar is supported by two poles on one end and a tree branch on the other. Secure the pulley about three feet above the frame. The bucket is filled, drawn up through the frame by a rope, and tripped by operating the bar. Platform boards are sanded off smooth, to eliminate slivers, and nailed about one inch apart on the end strips so water runs through quickly.—Hal Smith.

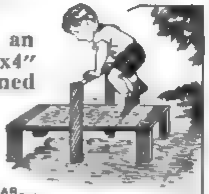



## *Novel Advertising Sign for Merchants*

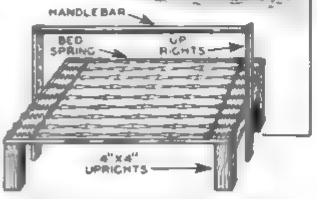
HERE is an easily made sign for merchants and theatre operators who are looking for something novel and attention-getting in the way of signs. A hole is drilled in the top of any type of barrel for the insertion of a round pole which rotates on a nail in the base. One or two show cards tacked to the pole inside the barrel act as propellers when the breeze is directed on them and keep the sign above turning. The head can be made of a cylindrically-shaped piece of wood. To make it more elaborate, cut out part of the side of the barrel, as shown in the smaller drawing, and tack in a strip of isinglass. In this way signs can also be used on propeller cards.—Walter Brixius.

# Home-built Toys to Amuse Children

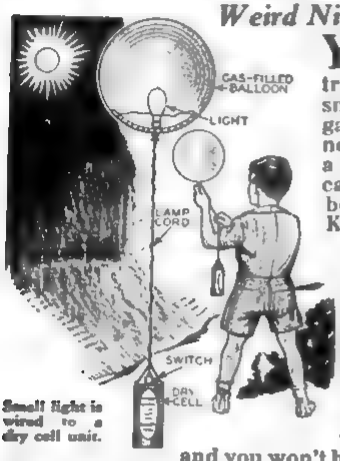
## *Child's Exerciser Made From Set of Old Bed Springs*



AN OLD set of bed springs of the stretcher type can be made into an excellent exerciser for children up to six years of age. Four 4x4" uprights are driven about a foot into the ground and the spring fastened to them high enough to allow its full stretch. A handle bar is then set about 13 inches above the spring and somewhat off-center so that the child will jump in the middle of the spring. The bar is supported by props on each side of the frame, as shown.—D. A. Butler.




## *Weird Night Light for Balloon*

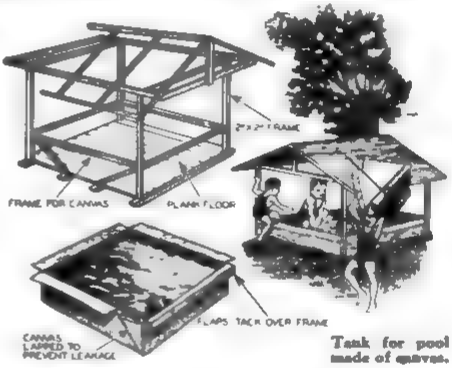



Small light is wired to a dry cell unit.

YOU can have a lot of fun at night with this electrically lighted balloon. A small bulb is fastened in a gas filled balloon and connected to a flashlight cell by a wire cord. A small switch can be attached so light can be turned off and on mystifying on-lookers.—Hans F. Kutschbach.

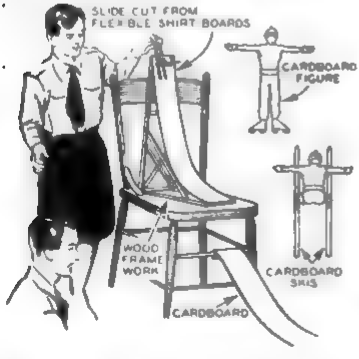
## *This Portable Outdoor Pool Has Canvas Basin*

THE youngsters will have lots of fun splashing around in this outdoor pool this summer and you won't have to worry about them getting in too deep. A pool frame is made as shown in the illustration, the roof being high enough so the tots can sit inside. A 2x3" railing is nailed around the sides as high up off the floors as the pool is to be. Brace each corner firmly. The tank is made from waterproofed canvas which is nailed in place around the edges, the flaps being lapped over the rails.—John Master.



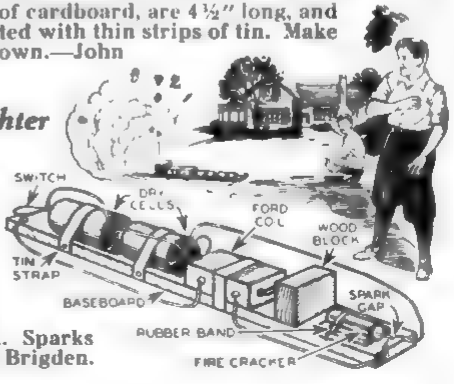

Tank for pool made of canvas.

## *Cardboard Ski Jumpers Entertain Kiddies*



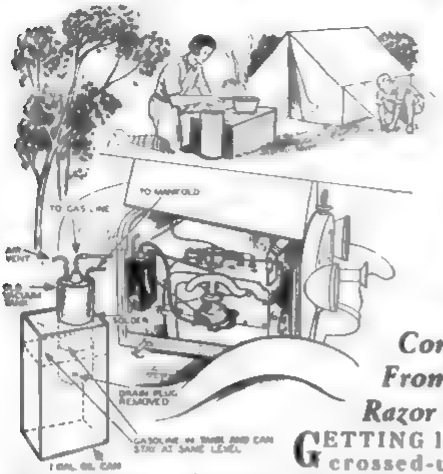

THIS miniature ski slide sends cardboard jumpers sailing through the air for a 20" leap. The men will land upright almost every time if properly made. They are cut out of flexible cardboard and should be 3¼" high and 3" across—from hand to hand. Skiis are made of cardboard, are 4½" long, and are weighted with thin strips of tin. Make slide as shown.—John O'Neill.

## *Safe Lighter For Firecrackers*




YOU can look forward to a safer Fourth of July if you rig up this cannon cracker lighter. Two dry cells, a coil from a model "T" Ford, and a wood block are fastened to a board and wired up as shown in illustration. Sparks jumping between gap will ignite fuse.—Junior Brigden.

# Making Campers More Comfortable

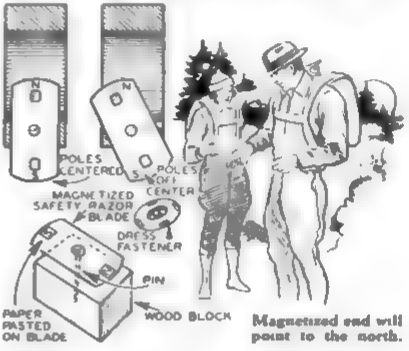


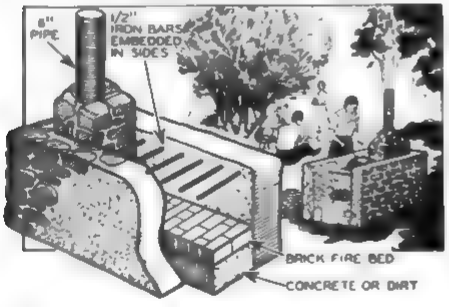

## *Ready Gasoline Supply for Campers*

CAMPERS usually find the process of siphoning gas from their car tank a rather "distasteful" process. Here is illustrated a simple means by which the gasoline is always available—all you have to do is to turn a pet-cock. The drain plug is removed from the vacuum tank, which is soldered into a 1-gallon oil can, as shown on the left. Also solder a pet-cock into the oil can near the bottom. Mount the fixture on the dash board under the hood with a sheet of strap iron and connect it up as an ordinary vacuum tank. The gas in the can will always be as high as it is in the vacuum tank.—Dick Cole.

## *Compass From Old Razor Blade*

GETTING lost or crossed-up in your directions when it is impossible to retrace your trail isn't much fun when exploring in strange woods. This handy little razor blade compass carried in your pack will put you right in a hurry. Magnetize one end of the blade and label that "N". This can be done by pasting on a piece of paper or tape. Nail the blade to a small wood block, slipping a dress fastener over the nail underneath the blade. This elevates the blade so it can swing free.—Douglas Thomas.



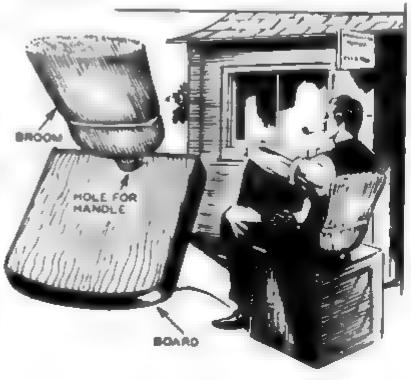




## *An Easily-Built Camp Barbecue*

IF YOU have a lakeshore lot or intend to camp for any length of time at one place, you will find a permanent barbecue built of bricks and stones picked up around the premises a real help in cooking. A little cement is needed to hold the iron roasting rods embedded in the sides and also to make the sides and chimney more solid. Build your fire bed over a foundation of concrete or dirt. The chimney pipe should be 6 inches in diameter and about 6 feet high. A small brick and stone chimney is built around it to hold pipe in place.—Robert Sadena.

## *Old Brooms Make Good Chair Backs*

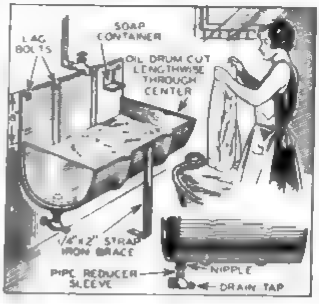
WHEN the time arrives for you to move out to camp or to the cottage, there are always 101 things to take along. Furniture is especially bulky and for that reason very little can be packed into the car. There is usually room for a sawed off broom or two, however, and with these you can make comfortable lazy-back chairs. One can be made by drilling a hole in a wooden box and inserting the short broom handle in it, as shown on the right. Another seat can be made by drilling a hole in a board. When this is done all but an inch or so of the handle must be cut off. The second type makes an ideal ground seat and takes up very little space when carried in the car. The chair back can also be used as a clothes brush.—J. C. Burming.



# Kinks to Aid the Busy Housewife

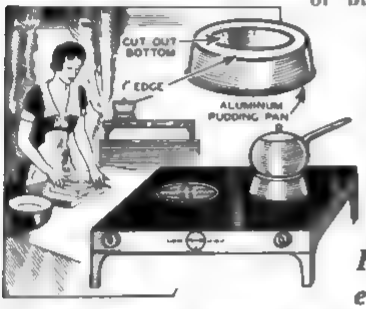
## *Basement Washtub From Discarded Oil Drum*

A LARGE oil drum, if properly cut, can be easily converted into a serviceable basement washtub. The drum is operated on as shown in the illustration, having the drum tap centered in the tub and allowing an 8" flap above the center on the back side. The tub is fastened to the wall with four lag bolts, one in each end of the top of the flap and one in each groove. The water faucet is arranged above the tub and the drain tap attached to the bottom by screwing a short pipe nipple, with a corresponding thread, into the hole in the drum. Attach to the nipple a pipe-reducing sleeve which will accommodate a threaded spout. Tub is braced by ¼"x2" strap iron leg which prevents front of tub from sagging or bulging.—L. E. Wilson.



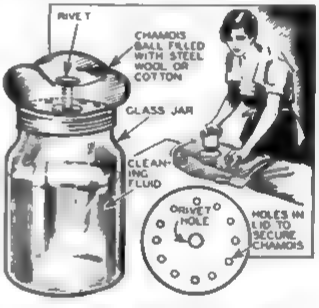

## *Simmering Attachment for Electric Stoves*

HOUSEWIVES often find difficulty in regulating electric plates when cooking foods that require a slow simmering heat. This situation is easily remedied. Purchase an aluminum pudding pan about 3" high and of exactly the same circumference as the burner. Cut out the bottom with a can opener, leaving a 1" edge all around. Invert the pan over the burner and place the stew kettle on it after contents have been brought to a boiling point.—M. D. McCarty.



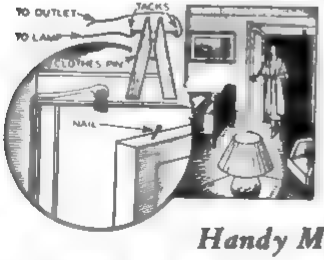

## *Home-made Cleaner Takes Out Spots*

RUBBING soiled clothes with dampened cloths sometimes fails to remove the spots, and often "fixes" them so that even the cleaner has difficulty in taking them out. An effective little spot cleaner can be made in a jiffy. Clean out an empty vaseline bottle and perforate the top. Then bore a small hole in the top so that a rivet can be run through. Wrap a small wad of cotton or steel wool up in a piece of chamois and fasten the ball thus formed to the top of the bottle, as shown. Fill the bottle with benzine or other cleaning agent.—William Truitt.



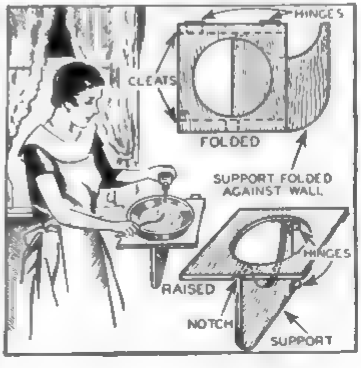

## *Lights Turned On When Door Is Opened*

THERE'S no stumbling around in the dark when reaching for the light switch if you rig up this switch. All you do is open the door and your lights are on. Using the type of clothes pin shown, drive small nails through as indicated and attach wires. Nails should meet and form contact. When door is closed, nail on door pushes other ends of pin together breaking the contact and turning out light. Opening door closes circuit. — A. Nelson.




## *Handy Mixing Bowl Board*

ANYONE who has ever tried to mix up a batter knows how inconvenient it is to have to hold on to the bowl with one hand to keep it from rambling all over the table. This little device will be welcomed in any kitchen because it holds the bowl securely, allows free use of both hands, and folds up against the wall out of the way when not in use. The board can be made of any material—¼" veneer being very satisfactory. Cut the hole the proper size for your mixing bowl and fasten the board and its supporting prop to the wall on hinges, as shown.—Oscar Wells.



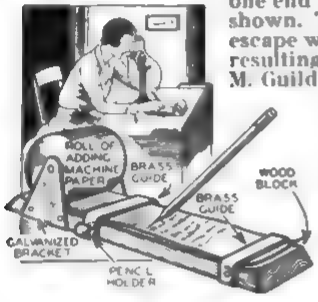
# New Wrinkles for Workhouse Fans

## *Novelty Jewelry or Handkerchief Box From Old Book*

FOR those who like to give hand-made gifts, this novel jewelry or handkerchief box is just the thing. It can be made from any heavy covered book. Turn back both covers and five pages in the front and back of the book and cut out the rest, as shown, leaving a ¾-inch edge all around. Nail these pages together with brads. Then glue the five pages on in front and back to cover up the nails. Cut out top and glue pages back on cover.—Marvin Townsend.

## *Spiral Grooved Dowels Prevent Glue Air Pockets*

HERE is an idea for the man who uses dowels in cabinet or furniture making. If these dowels are made on a lathe, they can be turned out in a jiffy. Work a spiral groove from one end of the dowel to the other, as shown. This groove allows the air to escape when the glue is applied, thus resulting in a stronger job.—Earle M. Guild.



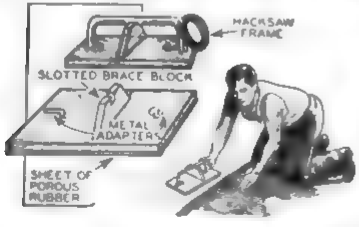

## *Memo Pad Uses Roll of Adding Machine Paper*

THE neat memo pad shown on the left is made by mounting a roll of adding machine paper between two galvanized brackets on an oblong wood block. A narrow screw holds the roll in the bracket and two metal guides keep it on the block. A loop in one serves as a pencil holder.—Hi Sibley.

## *Folding Ground Seat*

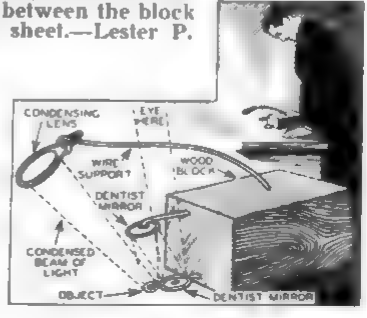
A FOLDING ground seat will add much to your comfort when at a picnic or when reading out-of-doors. The diagram on the right gives the dimensions of the lumber required and illustrates how the seat is assembled. Two pairs of square hinges size 2 or 2½ and a few ⅝-inch flat-headed screws complete the bill of materials. V-shaped notches are cut in the ends of the legs to prevent their slipping when the seat is used. The addition of two or three coats of paint will give it a neat appearance and at the same time prevent the wood from drying out and splitting. This device occupies a 3x12x24 inch space when folded up.—E. D. Roseman.

## *Handy Sanding Block for Large Surfaces*




A SHORT hack-saw frame mounted on a wood block by the use of metal adapters, as shown on the left, will make a dandy sanding block when working on large surfaces. The slotted brace block keeps the frame upright and prevents undue strain of the adapters. For best results, fasten a sheet of porous rubber between the block and the abrasive sheet.—Lester P. Young.

## *Simple Home-made Reflecting Microscope*

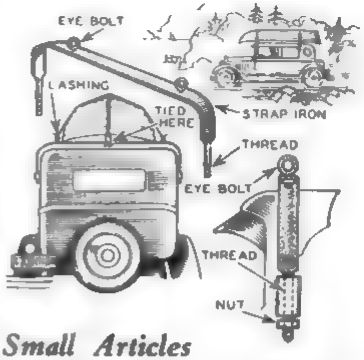


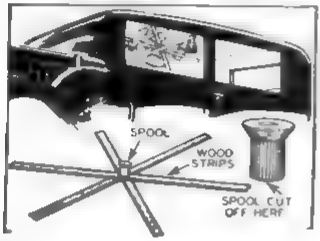

PERSONS who enjoy studying colors, insects, flowers and plant life will have a lot of fun with this inexpensive reflecting microscope. It consists of a wood block, two dental mirrors, a condensing lens, and a piece of copper wire. The accompanying diagram shows how the instrument is assembled. Bend the wire support so that condensed light beam falls just in front of lower mirror. Saw off mirror handles and drill holes deep enough to allow adjustment in focusing.—F. W. Salmon.

# Helpful Ideas for the Motorist

## *Metal Boat Carrier Protects Your Car Roof*

CARRYING a boat on top of your car usually results in considerable damage both to the car top and the boat. The use of a pair of iron straps, like those illustrated, will protect them both no matter how roughly the boat is loaded or unloaded. Make the carriers out of ½"x2" strap iron, bent to the shape of the top, allowing a 3" clearance. Before bending, heat the ends and hammer them into the shape of the hinge bolts, which they replace. Thread the ends about 1½" and insert in door hinges on the side of the car, as shown. Set the boat in the middle of the braces, drill holes in them and insert ½" bolts with "rope eyes." Lash the boat in position on sides and at each end to prevent sliding.—Thomas Moore.



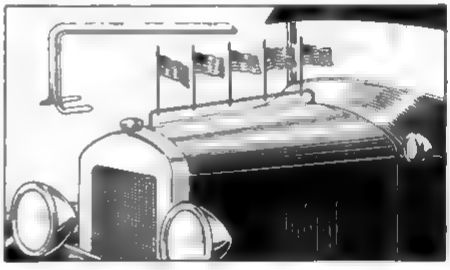



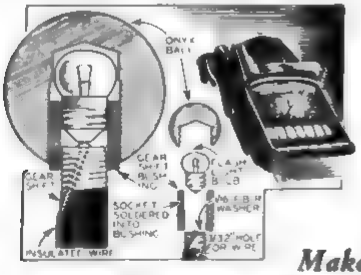

## *Ceiling Rack for Small Articles*

DRIVERS always have a number of miscellaneous items, such as gloves, hats, purses, etc., which they like to keep handy, yet not have them in the way or misplaced in the luggage. This ceiling rack will take care of these items in an efficient manner. Nail three narrow strips of wood together in the design illustrated. Then take a thread spool, cut off one end, and nail the frame to the top of the car using the spool as a washer. Articles can then be slipped over the rack.—Grace Borland.

## *Curtain Rod Mounts Flags on Hood*

WITH the Fourth of July but a short distance away, car drivers are beginning to think about how they are going to decorate their car. Here is a handy little kink for displaying small flags on your hood. It is made from a flat brass tube extension curtain rod. Split the ends with a pair of tin snippers and bend them so they will clip under the hood. Then drill small holes for the flags and your mounting is ready for use.—Milton Hooper.



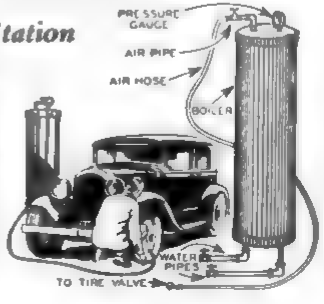



## *Illuminated Onyx Knob on Gear Shift*

WANT something novel for your car? Then rig up this clever illuminated onyx ball on your gear shift. It can be made by soldering a flashlight socket to the gear shift bushing. Attach a 6-volt bulb and drill out the onyx ball so that the globe can fit in. A piece of 1/16" fiber is fastened on the washer at the end of the gear, as shown, and wired by drilling a 3/32" hole diagonally to the end of the lever. Install switch on dash board.—Alton Wood.

## *Make Your Own Air Station*

A HOME air station capable of inflating tires to 65 pounds pressure can be built from a 30 gallon range boiler. Mount the tank in your garage and connect it up with two pipes at the bottom—one leading to the water faucet and the other to serve as a drain. At the top install a pressure gauge and a small pipe with a shut-off tap, which connects it to the air hose. Pressure is generated by turning on the water and allowing it to run into tank, thus compressing the air to fill your tires. When tank has lost its compressed air, shut off the air tap and drain water out. When tank is empty, repeat the process. Device is shown at the right.—T. L. Parker.



# Make Big PROFITS Raising

Costing only about two cents each to raise, frogs like the one above, ugly though he is, bring $7 and $8 in dozen lots, and constitute a rare delicacy on the dinner table.

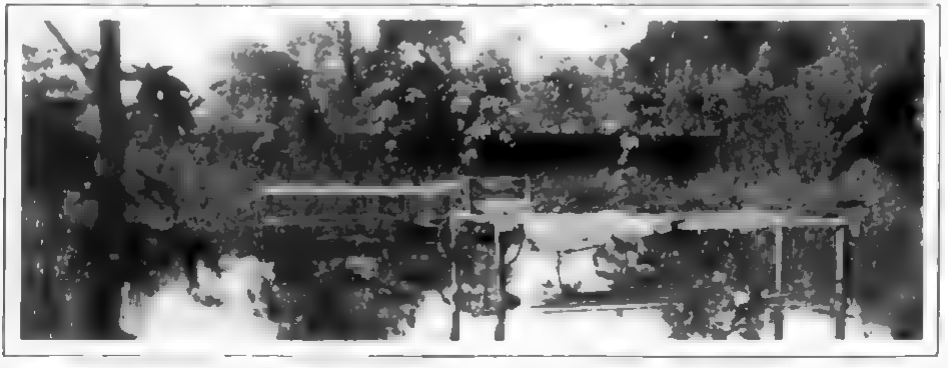
Crayfish, which form food for frogs, often attempt to burrow under the low board fence to escape from their pond. Frog "farmer" is recovering a prisoner attempting jailbreak.

THERE'S plenty of profit in frogs. Two-cent frogs—the cost to raise each of these ugly green creatures that are transformed into delicate morsels in the skillet—become dollar-and-a-half frogs' legs and saddles between the pond and the table. More than two hundred frog farm operators, between the Atlantic and the Pacific, are waxing fat and rich from their profits.

From one relatively small "farm," which in reality is a series of small ponds, 500,000 frogs were shipped in 1931. And one frog "farmer" on a 20-acre ranch in Lakeside, Cal., has started the production of one million frogs a year from 300 small ponds. Frogs that cost him two cents each wholesale at $5.70 a dozen—and his customers pay the freight. Frogs average in price $3.00 a dozen. Hotels pay $7 to $8 a dozen for jumbos.

Here's a beauty of the frog business, as M. W. Herriman, veteran frog raiser, expresses it: one man can conduct and operate a farm containing as many as 300 individual ponds. He needs aid only during the harvest season, when a few assistants catch the frogs, kill and dress them and pack the bodies, tied in bundles of 12, in crushed ice.

The Rana catesbiana, or common bullfrog, is the most widely cultivated to provide these fortunes. This is the largest



Bullfrogs require shade and restful surroundings. This view of the inside of a typical main frog pond shows the tall wood fence which encircles the pond, shrubbery surrounding the water, and the shade-providing lattice table in the center.

# Bull Frogs for the MARKETS



Above photo shows fore and aft views of two jumbo bullfrogs, measuring over eighteen inches long.

Surface minnows to feed the frogs are raised in a small subsidiary pond, and scooped up frequently and poured into the main frog pond. Farmer above is scooping up victims with net.



The principal nutriment for bullfrogs are surface minnows. Above you see a hundred of the little fellows in a glass jar, ready to be poured into the frog pond to act as food.

frog in North America, commonly being about eight inches in length and with the legs extended totals about 18 inches. The head is broad and flat and the body is extremely stout and slightly flat, and should weigh, when mature, two-and-a-half to three pounds alive. The lifetime of a bullfrog is 30 years.

A frog farm is like nothing you ever have seen. Possibly you can take a visit in these two pages to such an institution to see what makes these creatures thrive on diets that other animals scorn. Hand a bullfrog a small snake, and he'll gobble it down. Or he'll accept a smaller frog, for he's cannibalistic. Or mud hens or humming birds or crayfish or surface minnows. Anything that swims or flies he'll gulp down and ask no questions.

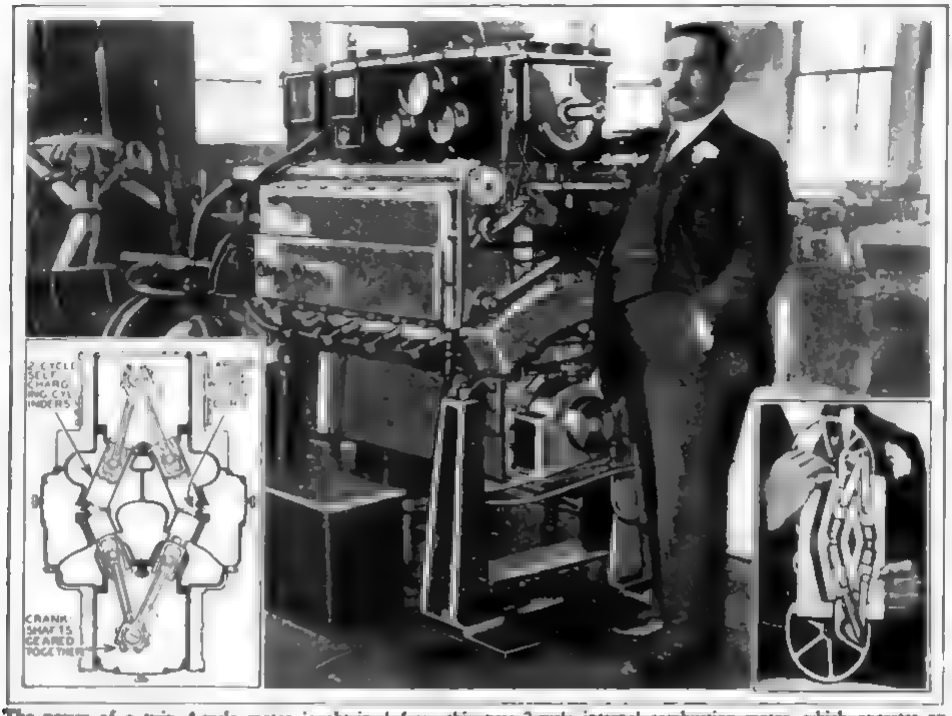
Disease is seldom if ever known among frogs. Their routine of life is simple. The frog comes into the world from eggs, is hatched into a tadpole, transforms from that stage into the frog state, then grows in nine months to two years into a full-grown specimen ready for the frying pan and the fire.

The mechanics of frog raising involve no hocus-pocus or secrecy. One typical frog farm, in its infancy, contained three large ponds. In the main pond, some 200 feet by 100 feet, 106 pairs of Louisiana bullfrogs mated, laid their eggs and enjoyed life. Crayfish, minnows and other live insects were furnished them from time to time.

In the second pond the crayfish and minnows, eating to their heart's content of arrowhead, pickerel weed, water lettuce and water hyacinth, fattened for the time when they were poured into the main frog pond. And in the third the tadpoles, removed from their cannibal parents, flitted without ceasing from bank to bank until that time arrived when they changed into frogs.

*(Continued on page 188)*

# 2-Cycle V-Type Motor Eliminates Crankcase Compression




The power of a twin 4-cycle motor is obtained from this new 2-cycle internal combustion motor, which operates on Diesel principles but runs on either gasoline or fuel oil. Left diagram shows how crankcase compression is eliminated.

## Have a Look at the New Eyelashes

A NUMBER of people will undoubtedly question just what is meant by the word "beauty" after looking at the photo below showing the new eyelashes introduced to fashion at the recent national convention of hairdressers, cosmetologists and beauty culturists held in New York City.

Two of the "specimens" exhibited at the meeting were the platinum beaded and golden eyelashes worn by the girls in the photo.

Beauty culturists wearing the latest platinum and golden beaded eyelashes introduced at their national convention.

MR. F. B. STEARNS, a pioneer in the automotive industry, has developed a powerful internal combustion engine based upon Diesel fundamentals which, he believes, will revolutionize marine, truck, airplane and railroad transportation. The motor is unfortunately too heavy for pleasure vehicles.

Made of aluminum and aluminum alloy, the motor, shown above, is two four-cylinder, V-shaped motors inverted upon each other. In this way the 8 cylinders are said to develop the same power as a 16-cylinder motor. There is practically no vibration and the engine consumes but .42 pounds of fuel per horsepower hour.

The new engine weighs 2000 pounds and can develop 160 horsepower. It will operate on either gasoline or fuel oil and all carburetion is effected within the cylinder.

## A Few Uses for Hand Tire Pumps

DON'T throw away your seldom used hand tire pump. If there is a hydrostatic fuel gauge on your car, its accuracy may be affected by the condensation of moisture within the connecting tube. When the gauge is known to be inaccurate, the tube can be disconnected and the hand pump used to blow out the moisture. The pump also cleans fuel lines very thoroughly.

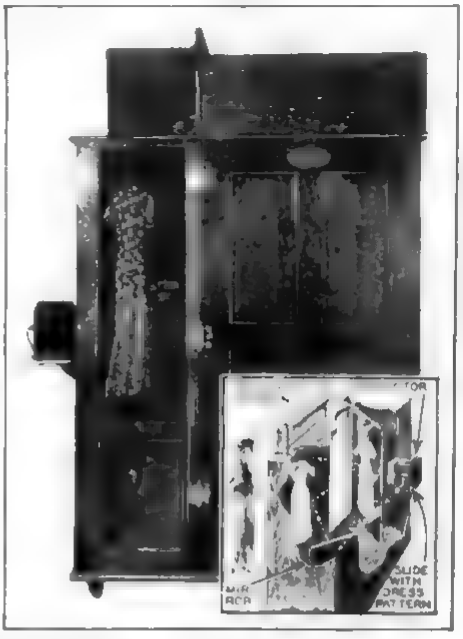
# Magic Lantern Shows Pre-view Image of Home-made Frock

A NEW adaptation of the movie tickers which reproduce stock market quotations now makes it possible for women to visualize immediately a completed garment made up of any material in any style or pattern.

The equipment, shown on the right, consists of a cabinet with three mirrors inside and a lantern on the outside which projects a light through slides showing pattern outlines.

The light is then reflected against the dress material, superimposing it on the pattern and reproducing the image of the finished gown.

In using this new device, dressmakers may experiment with materials and find the one most suitable for the pattern. The completed image flashed upon the screen not only shows the material and design but the color and texture as well, including front and back views.




When dress customer stands before screen, a beam from magic lantern superimposes material on dress pattern.

## A New Evidence of Intoxication

IN THE future, should the recent suggestions of German experts be carried out, the first policeman or ambulance surgeon to reach the scene of an automobile accident will take a blood sample from each of the drivers.

This specimen will offer indisputable evidence as to whether or not the driver was intoxicated by alcohol at the time and may be held legally responsible.

## Auto Movie Theatre Has Complete Projection and "Talkie" Equipment

CARRYING complete projection and "talkie" apparatus, a portable movie theatre, shown below, opened for business in Los Angeles recently. The projection room is immediately behind the driver's seat and the translucent screen is in the rear of the van and viewed from outside.

When giving a performance, seats are arranged in a semi-circle behind the van. The pictures are projected onto the screen which is shut off from the sunlight or street lights by the overhead and side flaps.

Complete projection and "talkie" equipment is installed in this portable movie theatre. Screen, on the back, is translucent.

# How to Build "Bouncer"

Slightly over fifteen feet in length is this simple, cheap rough water sailboat. Total materials bill was under $40.00.

**This is an improved version of the famous Annisquam "Fish" Class Marconi rigged catboat. Mr. Miller built his boat as pictured here for less than $40, making even his own sail. All of this fine adventure in boatbuilding is here told with that fine frankness which characterizes the old salt from 'way Down East in Massachusetts.**

THE popular *Fish* class racing cat is built by a sole yard, Montgomery of Riverdale, Mass. About three hundred of them have been put out so far, fast, light, seaworthy, costing complete about $280. The rig is Marconi, a twenty-five-foot mast which costs alone, with its stretchers, shrouds, track, and fixtures, $48.00. It is a picturesque little yard, a construction shed or two on a tiny salt creek flowing into Annisquam River, and maybe a dozen of the dainty little cats, being rigged and finished for shipment, in a row by the launching stage. Mr. Montgomery himself designed the lines of the original *Fish*, another case of a native genius like Archie Fenton of Gloucester memory. He has had imitators. But nothing turned out could compete in a race with the true *Fish*.

As I wanted a boat that would be able in short, choppy seas on lakes and sounds of different behavior than the ocean seas around Annisquam, I took slight liberties with the *Fish* class forefoot. The true stem has a radius of not less than three feet and sweeps up in a long curve that gives finer entrance lines but less lift forward against short, steep seas.

As may be noted by the drawings herewith, a two-foot radius was chosen for the stem, the lines being otherwise about those of the true *Fish*. This bluff forefoot gives a somewhat harder entrance but will be found valuable in meeting a lake or bay sea whipped up by the usual summer squall or hard blow. In the matter of weight there is also digression. This boat on the freight scales weighed 750 lbs.; the *Fish* class boats weigh 450. The difference is due partly to using cypress planking instead of light white pine, and partly to the heavier construction, in oak centerboard logs and yellow pine trunk, board, and deck beams.

The boat will probably be slower than a real *Fish* when raced against one. I do not propose, however, to intrude on Mr. Montgomery's specialty the credit is his alone for being sole designer and producer of this popular class. But I do offer here a fast racing catboat that the home builder can produce for himself at little cost and be assured of a fast, handy day-boat for lake and harbor sailing—with capacity to take a heavy sea and stay dry. With this preamble let us get on with the details on how to build her.

Let me confess at the outset that my

Here we have the outboard profile and sail plan of "Bouncer" which shows the placing of the mast and the amount of rake to give it. Text tells how to cut and sew sail.

# —a Fish Class CATBOAT

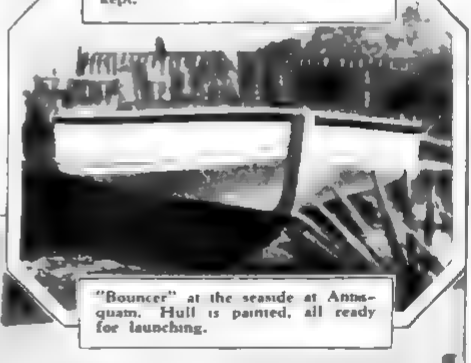
*by* WARREN H. MILLER

hobby, or avocation, as it were, is boat building. Other yachtsmen may play golf or tennis when resting from the toils of yacht racing, but give me a hammer and a saw and some wood and I am happy. The offenses to date comprise a 35-ft. power cruiser, a 24-ft. tabloid schooner, three small sloops, and four canoes. I do not pretend to any facility with tools but do manage to build tight boats. It is great fun fussing with designs and seeing them grow later in full-size oak and pine. One caution: be your own amateur boat builder if you like, but never be your own amateur naval architect. It is a science by itself, designing the waterlines of a boat that will be fast and seaworthy. Some of the most disappointing structures ever built were home-designed. You may think you know, but you don't.

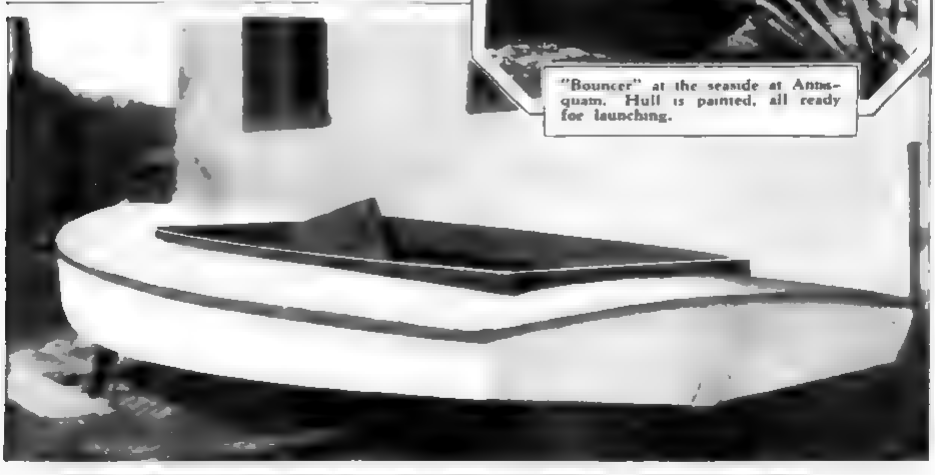
### Design Is Well Tried

Wherefore, when we planned to amuse ourselves during this last winter by building a boat, we took the lines off a *Fish* class cat lying on the dock in Gloucester and knew we would have something when we got through. It may seem beyond the reach of amateurs to build a racing class boat—something for regular yacht yards—but there is nothing difficult about the popular *Fish*. It is skipjack model and therefore far less labor than a round-bottom boat of any type, having no plank curves to dap out at

"Bouncer's" sails slide on tracks so that it is easily taken ashore, safely kept.

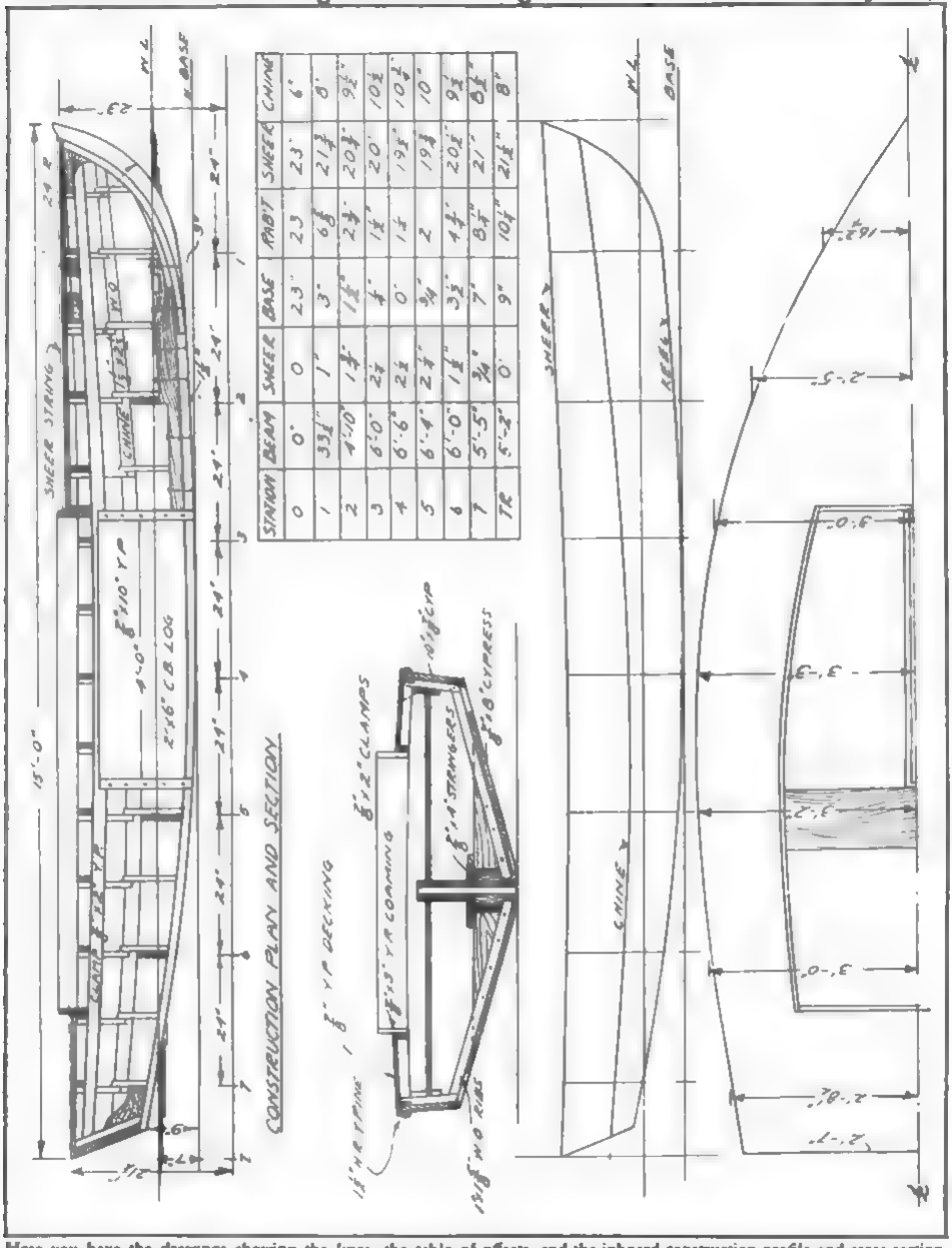


"Bouncer" at the seaside at Annisquam. Hull is painted, all ready for launching.



The form of "Bouncer" is of the well-known skipjack type, which is the granddaddy of our modern v-bottom runabout designs. In the true skipjack the vee of the hull is practically constant, the deadrise for all frames being about equal. Properly balanced after changes in many hulls preceding her, "Bouncer" has proved fast, sensitive and absolutely dry.

## *These Lines And Arrangement Drawings Show "Bouncer's" Simplicity*

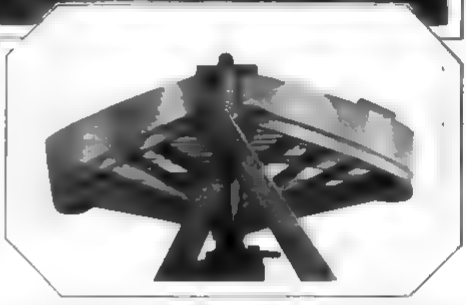



| STATION | BEAM | SHEER | BASE | RABT | SHEER | CHINE |
|---|---|---|---|---|---|---|
| 0 | 0' | 0 | 23" | 23" | 23' | 6' |
| 1 | 3'3½" | 1" | 3" | 6¾" | 21'3" | 8' |
| 2 | 4'-10" | 1'3" | 1'2" | 2'3" | 20'3" | 9'2" |
| 3 | 6'-6" | 2'2" | 4' | 1'2" | 20' | 10'1" |
| 4 | 6'-6" | 2'2" | 0" | 1'2" | 19'2" | 10'3" |
| 5 | 6'-4" | 2'2" | 3'4" | 2" | 19'3" | 10" |
| 6 | 6'-0" | 1'2" | 3'2" | 1'3" | 20'2" | 9'1" |
| 7 | 5'-5" | 3'4" | 7" | 8'3" | 21'" | 8'2" |
| TR | 5'-2" | 0" | 9" | 10'2" | 21'2" | 8" |

Here you have the drawings showing the lines, the table of offsets, and the inboard construction profile and cross section. The arrangement plan is also shown. The simplicity of the boat's scantlings (lumber sizes) can be readily seen for there is not a stick in her which cannot be had at most any local lumber yard anywhere in the United States. The lines must be laid down full size on sheets of brown building or wrapping paper, which are pasted together to make a sheet large enough to reproduce the lines drawing full size. Offsets table contains frame sizes.

every rib with an adze, and requiring no plane finish all over outside to take off the flats of the planks. Its model seems to be the fast "scow" type but provided with a lifting bow to meet large waves. As its home is Annisquam, Mass., such a bow would be needed. Also for us when shipped north to Gloucester, our own home port. The con-

After the frame has been set up on the strongback which holds the keel to its proper sweep, the topside planks are put on as the drawing to the right shows. Then, as above, the hull is turned bottom up and planked on bottom. Wrapped in rags, saturated with boiling water, planks bend.



This shows manner in which the keel and stem are mounted on a stout strongback so that the frames can be fastened in. See opposite page for fastening sizes. Then the topside planks are put on. They can be bent by applications of hot water administered to a swathing of rags about the plank.

struction type is of the flat keel, bent to the given rocker, and provided with caulking lips by inset planks an inch wider aft, by the overhang of the centerboard logs amidships, by the mast-step timbers and fish-plate forward.

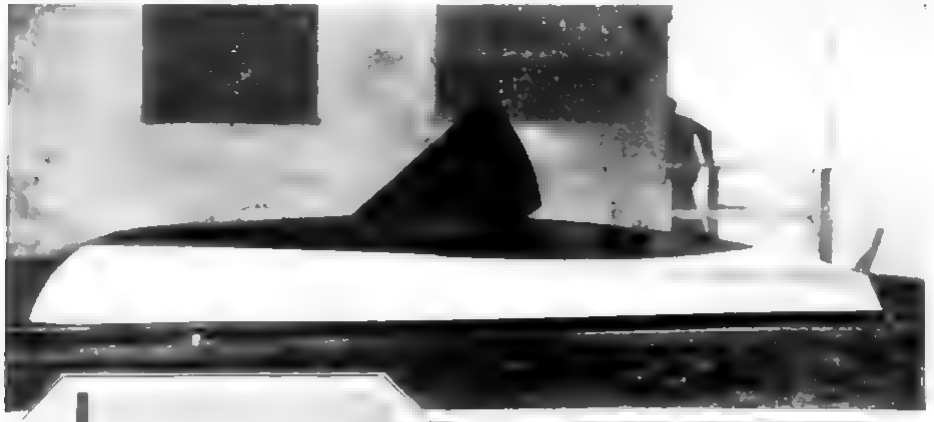
### Construction

Further longitudinal strength is gotten by nailing fast the two floor stringers along each side of the centerboard trunk, the rest of the floor gratings being removable. The general model is wide and flat, intended to skim over the water, the centerboard and rudder (extra large, of four square feet) providing the lateral plane. The board itself is overlarge, four feet long by two feet eight. The class is well known as to fast performance with jib-headed rig. I provided two steps in this boat, as I intend to try her later with high and narrow meter-class mainsail and Genoa jib.

The frame elevation, section at Sta. 4, and station table give all the measurements

Some of the extreme sny (combined twisting and bending) which the bottom planks must take are clearly shown in the above photo. The fitting of these planks is not difficult in the least if approached in the manner described by Mr. Miller. Here we see the bluff bows which allow "Bouncer" to be particularly at home in waters where there are short choppy seas, such as on inland lakes and tidal waters, or sheltered saltwater bays where "the wind, she blow."

## *These Shots Show "Bouncer" Ready for Decking, Then Painted for Use*



**Putting on the decking, prior to planking the bottom. After the deck beams have been notched into the clamps the straight decking, which is later covered with canvas, white lead or Jeffery's C quality marine glue seals the seams.**

**The final painting job is shown above just after having been completed. Use paints which are specifically branded as marine paints, as ordinary paints peel off in sheets after a few weeks of use. White topsides and green bottom are usually used. The combination is pleasing and wears well.**

needed. You note that they refer to a base line tangent to the keel. In building, this base line is not imaginary, nor a string, but is a solid plank of four-by-twelve yellow pine or something equivalent, because the keel has to be bent up to fit the considerable rocker shown and must therefore be held down to something solid by stout cleats. These are not taken up till the frame is ready for turning over for planking. There is no stern skeg, probably for quickness in coming about.

The first operation, then, is to slot the keel 4'3" for centerboard, fine it for a foot and a half to three inches where it meets the tail of the stem knee, and bolt stem knee and keel together by the fish-plate that joins them. The joint will want a half-inch soft wood stop-water plug driven through there, halving on the joint. The keel is then bevelled ¾" on both edges, planed to meet the stem rabbet fair, centerboard posts erected at each end of the slot. These are of 1"x1⅝" oak rib stock and are spiked in the centerboard slot with lower ends well daubed with white lead paste.

This assemblage of keel, stem knee, and posts is then taken to the base plank and erected on it and two cleats spiked down over it, one aft of Frame 5, the other just forward of the forward centerboard post. The keel is now bent up to the rocker shown and checked with a foot rule. A wooden box under where the transom will cross and a block under the stem knee are enough to spring it properly.

The boat is fifteen feet long over all. Lay a rod that length from the tip of the stem knee aft to find the place for the transom. It has a slant of 4", so its foot will come four inches within the fifteen feet. This transom is of 1½"x12" y. p. stock, has a crown of 2", and comes in 2" on each side. It is set up at 15 ft. where the rod shows, backed by a riser 4" stock off the keel timber, and that backed by a knee as shown. Do not notch it for chines and stringers till later.

### Building Frames Is Second Step

There are seven stations from bow, spaced two feet. These seven frames have 6"x1¼" floor transoms and give the mould of the boat. To make them, refer to the station table, which gives base-sheer heights, base-rabbet heights, sheer-chine depths, and beam widths. Lay out one at a time on a scale of 3" to the foot, on large brown paper, as per frame section Sta. 4, putting in the planking and chine sections so as to agree with the outside measurements as given in the station table.

The come-in of the frames is ¾"; all except

*(Continued on page 184)*

# Free Wheeling Feature Installed in Any Make Automobile

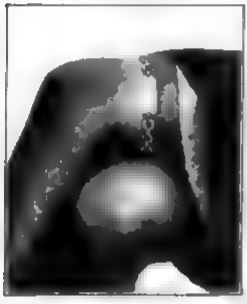
EVERY car can now be equipped with free wheeling by the installation of a simple little attachment, shown in the photo on the right, which eliminates the human element in clutch operation.

The mechanism is made of super-treated stainless steel, bronze and cast iron, and thoroughly sealed to prevent dirt and oil from entering the housing channels. There are no parts to require servicing or lubrication and no leather washers to wear out. The entire mechanism works automatically.

The change from free wheeling to conventional gear shifting can be made at any speed and under any conditions by merely pulling out the control button on the instrument board.

With this simple attachment, any make of car is given the advantage of free wheeling. It is operated by a button on the dash board and can be thrown in or out at any speed.

## Identification Garter for Women



Complete description of wearer is engraved on metal plate.

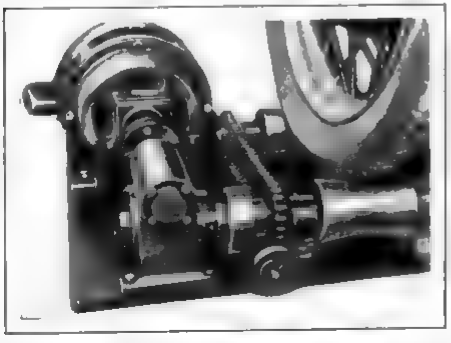
IDENTIFICATION of women injured in accidents is often slowed up because purses, parcels and papers have been lost or stolen in the melee.

This novel "tag," shown on the left, is made of gold or silver and has the full description of the wearer engraved on the smooth plate.

## Quick Way to Start Stiff Motors

CARS which have been overhauled generally or had their bearings tightened can be easily started in the garage by mounting the left rear wheel on the starter mechanism, shown in the photo below, which replaces the old "towing" system.

Power is transmitted by a three horsepower motor through the reducing gears. This action rotates the wheel and, if car is in gear, turns over the motor.



Stiff motors are started by putting the car in high gear and turning over the rear wheel with motor-driven gears.

## What's in Synthetic Perfumes?

STRANGE chemical combinations are involved in making the synthetic perfumes which are steadily displacing the perfumes made from natural flowers. For instance, castor oil is the basic material for certain scents.

A vanilla perfume, as sweet as the natural scent, can be made from coal tar. Phosgene, the deadly poison gas, has been combined with acetylene derivatives to produce an exquisite violet leaf perfume. Certain artificial musk perfumes belong to the same chemical family as the high explosive TNT.

## Collapsible Umbrella Fits in Bag

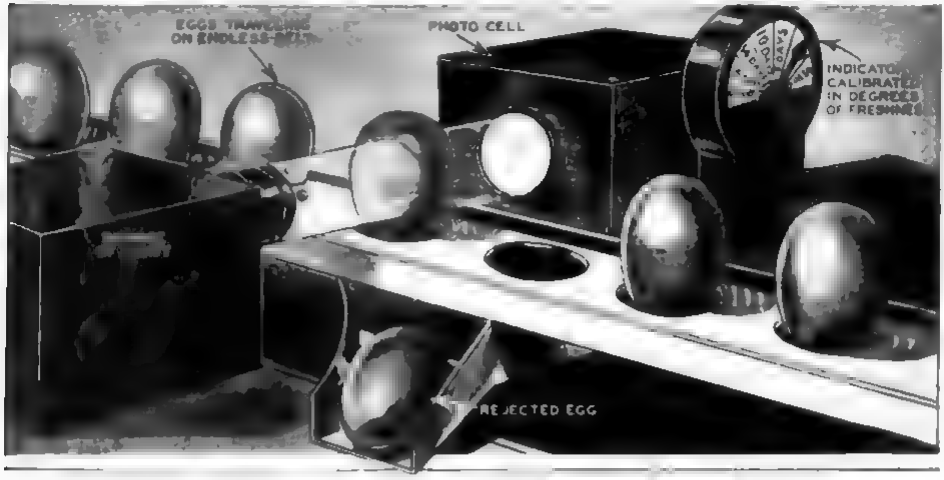
HERE is the umbrella that shoppers and travelers everywhere have been looking for. It can be folded up and packed neatly in a bag or grip when traveling, or tucked away into the shopping bag when venturing out on days when low-hanging clouds forecast a shower.

The collapsible umbrella is being made in sizes for both men and women and can be obtained in a variety of colors—a feature that will appeal to the women.

Photo on the right shows small size of umbrella when folded up.

When not in use, umbrella can be folded up, as shown above, and tucked into shopping bag.

# Electric EYE Tests Eggs for FRESHNESS




Eggs being tested for freshness pass between electric eye and light source, being rejected if they are too antiquated. Eggs destined to become chicks can also be tested to determine state to which chick has advanced during hatching process.

EVEN an unborn chick can have no secrets from the all-seeing eye of the photo-electric cell. Now an egg may be placed in front of one of these electric eyes, and an electrical meter, calculated in "chicken life" units, will indicate just how far the embryo chick has grown and how long it will be before the youngster will pick his way to the light.

In the test, the egg is placed between the light source and the photo cell, which registers the degree of light transmitted by the egg. This quantity of light, which depends upon the freshness of the egg, is registered on a supplementary meter, so that the poultryman can see at a glance how his hatch is coming along. The machine also tests eggs for freshness, rejecting the bad ones.

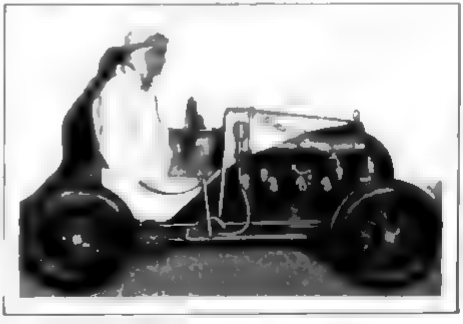
## Funnel Device Prevents Clogging

This device, placed in funnel, prevents clogging of liquid.

HOUSEWIVES know what a nuisance it is to try to pour liquids into a funnel that gets clogged up at the slightest provocation. The device shown at the left doesn't permit that. Provided with a special vent arrangement, it allows the air to get out when the rod is pushed down, freeing the liquid and eliminating considerable exasperation.

## Midget Racer Does 101 M.P.H.

SIZE is no handicap to the midget racing car shown in the photo below, for it stepped out at a speed of 101 m.p.h. recently on the Indianapolis speedway. K. L. Moorehouse, designer of the "Little Mystery," as he affectionately calls his creation, built the car himself as a hobby. A tiny four-cylinder engine powers the car, developing 44 h.p. and running 51 miles on a gallon of gas.



It's small but it's fast—this midget racer. Powered by 44 h.p. motor it hit off 101 m.p.h. at Indianapolis speedway.

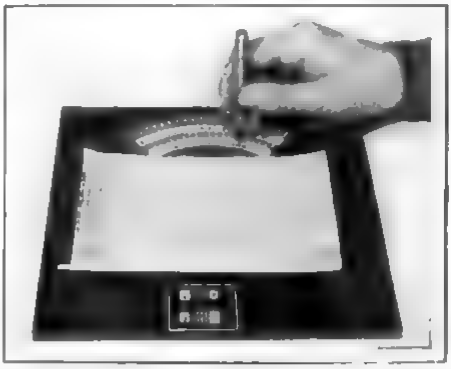
## Rough Riding Autos Injure Health

SCIENTIFIC support for the popular idea that traveling in a rough riding automobile may injure health was supplied in a recent scientific address. Long or frequently repeated automobile trips are likely to affect the kidneys by causing congestion of these organs with blood, often followed by actual bleeding, which is dangerous.

# Bridge Scores Correctly Totalled on This Dial Calculator

HOW do we stand? Bridge players can have the answer to that question always before them when keeping score with the new cardboard bridge calculator shown in the photo on the right.

The device has two registering dials which both add and subtract. One is for marking "honors," and the other for recording "tricks." The scorer is operated by placing the point of a lead pencil in the correct figure and dialing after each hand.

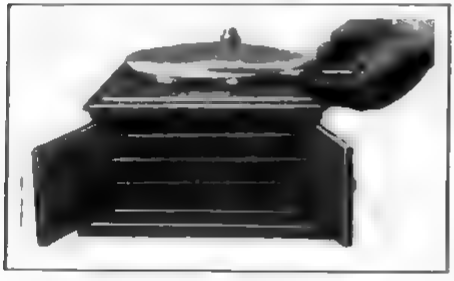


After each hand, scores are registered on the bridge calculator by dialing with pencil point. Honors and tricks are recorded separately and standings are always totalled.

## Use Old Phonograph as Grindstone

OLD phonographs can be made to do double duty by changing the turntable into a novel grindstone for sharpening knives, chisels and other small cutting tools.

This home-made sharpener is rigged up by cutting a piece of emery cloth of the circumference of the turn-table and slipping it over the revolving axis. When the motor is started, emery wheel turns.



Circular sheet of emery paper is placed on turn-table and forms a revolving grindstone when the motor is switched on.

## Odorless Rubber Wearing Apparel

AFTER several years of laboratory experimentation, a prominent rubber products company announces the discovery of a process which entirely eliminates the odor from rubber products intended for personal uses.

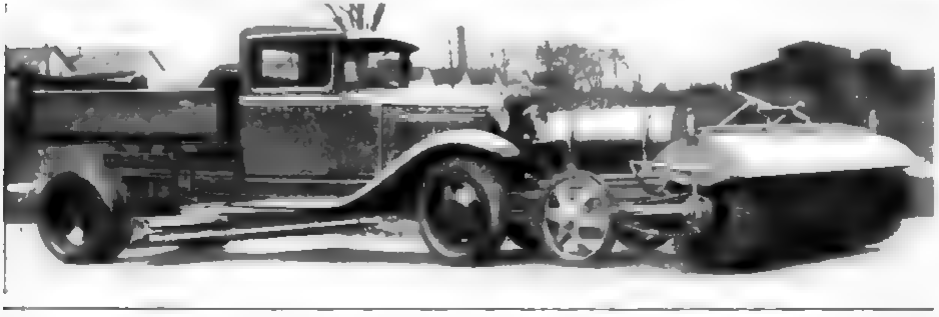
Investigation indicated that the natural rubber smell was one of the most obnoxious odors known to prospective purchasers. The new chemical method of neutralizing this odor is therefore looked upon as an outstanding research achievement.

Following this revolutionary discovery, the company is now treating all rubber bathing wear with the new chemical, in addition to avoiding the use of such chemicals as curing agents which have the slightest irritating effect on the skin.

## Street Cleaning, Grading Attachments Do Complete Jobs at Fast Pace

STREETS and roads may be sprinkled, swept and scraped by new attachments that fasten to standard 1½ and 2-ton trucks. The sweeper is a 32" revolving brush mounted as shown below. A gear-driven water pump in front of the brush assures a positive flow of water as devices clean 6½-foot lane at the rate of 10 miles an hour.

The hydraulically-operated steel spring scraper mounted under the truck body can be operated up to 15 miles an hour.



With a 32-in. revolving brush and a gear-driven water pump fastened to the front of this 1½-ton truck it will clean a 6½-foot lane at the rate of 10 m.p.h. The hydraulically operated steel spring scraper fastens under the truck body.

# Make the Best DE LUXE

Fig. 1. Hexagonal-shaped rods are built up from six triangular pieces as at top. Below is double joint, providing extra strength.

Fig. 2. At left are seen four basic parts for construction of rod-tip, middle, and butt joint and ring cork-covered butt. Above (Fig. 3) photo shows fittings necessary. It is advisable to build two tip joints, one with plain tip and other with agate tip in case of breakage.

**"Custom built" fly rods that will delight the heart of even the most fastidious fishing fan may easily be constructed in any moderately equipped workshop by following simple directions in this article.**

THE best fly rods are the hand-made ones. The cost of hand-made rods varies from around $30 up to $100 or higher for the fancier and best built specimens. No machine made rod can equal the better hand-made types for service and action.

There was a time when the building of a rod was beyond the skill of the amateur builder because of the difficulties of cutting and gluing together the triangular strips of bamboo that make up the hexagonal joints. Now, however, all large fishing supply houses carry or can obtain joints already built up.

### Fishing Supply Houses Furnish Parts

The fittings for the rod, too, may be obtained in many grades, ranging from the nickeled metal through the brass fittings to the finer fittings of German silver and white metal.

Before starting to build a rod you will want to determine for what type of fishing the rod is to be used. Sections and fittings are obtainable for rods varying from the lightest trout rod of 2¾ ounces, eight feet long, up to the heaviest salmon rods of 20 ounces, 14 feet long.

### You Can Build Any Size Rod

For trout and lighter fishing the popular rods run about 4 to 4¾ ounces and from 8 to 9½ feet long. For bass fishing the size usually chosen runs from 4¾ to 7 ounces and from 9½ to 10 feet long. The heavier rods are for salmon and heavy fly fishing. I obtain my supplies from a firm that carries the materials for making 15 sizes and weights of fly rods.

Fittings must be obtained for the special size of rod desired and may be bought separately or in sets of the quality desired.

Building the rod consists of fitting the accessories to the joints, winding the rod with silk wherever needed and finishing with varnish. Fig. 2 shows the four basic parts of the rod—ring cork-covered butt, butt joint, middle joint and tip joint.

In Fig. 1 is seen a cross section of a

# Fly Rods in Your Workshop

*by*
**RUFUS E. DEERING**

joint, showing how it is built up of six strips of bamboo glued together. Where considerable backbone is desired in a rod there is also available double built bamboo joints which really consist of one rod built and glued within another.

Such a construction gives two layers of the tougher outer layer of the bamboo insuring more strength and backbone in the rod.

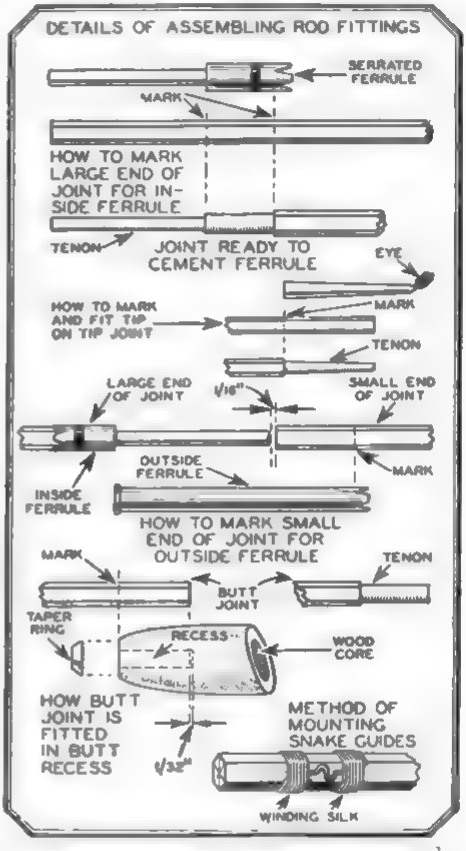
It is customary to build two tips for each fly rod, one to be held in reserve in case the other is broken or injured while on a fishing trip.

In Fig. 3 is shown the chief accessories for the rod. These consist of a reel seat, ferrules for each joint in the rod, two different types of tips—agate and plain—one agate guide for the butt joint and a number of "snake" guides for winding onto the joints as line guides. Other materials needed are waterproof ferrule cement, winding silk in the colors desired, a small bottle of winding silk preservative to keep the varnish from fading the windings, and special rod varnish for varnishing the completed rod.

### How to Fit Ferrules on Joints

The method of fitting the ferrules and rod tips is shown in the top drawing in Fig. 4. One pair of these ferrules is to be fitted between the butt and middle joints and one pair between the middle joint and the tip.

Always fit the inside ferrule first. Lay the proper inside ferrule alongside the butt end of the middle joint and mark on the joint the full length of the ferrule from the closed end up to the bottom notches of the serrated end as shown. Then make another mark on the joint opposite the shoulder of the ferrule. Other types of ferrules may be used but serrated ferrules are shown here because they make a far stronger joint.



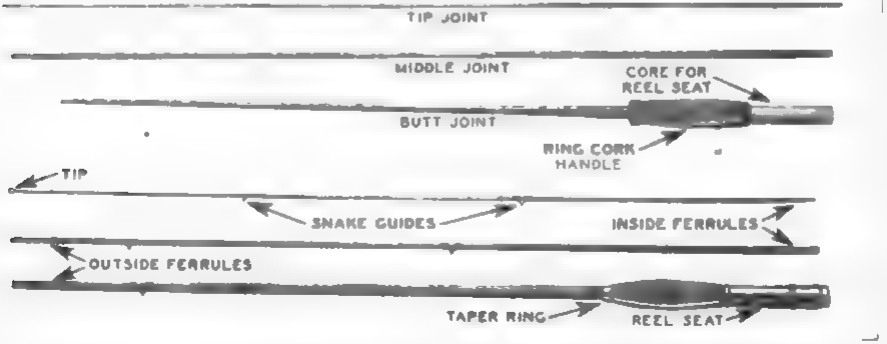
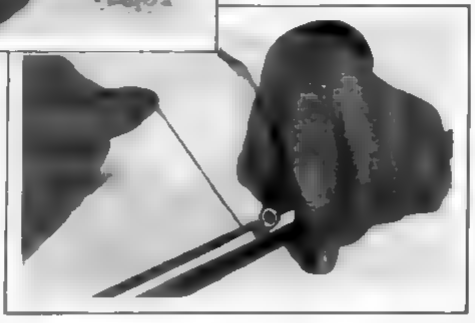




Fig. 4. In drawing at top right is seen methods of fitting on ferrules, tips, reel seat, and snake guides. Greatest care is required securing snug fit for ferrules. Photo directly above shows "raw" joints and joints with fittings in place.

Fig. 5, above, illustrates the manner in which ends of joints are whittled down to take the ferrules. Craftsman is seen cutting the shoulder. Fig. 6, at right, shows proper method of wrapping the winding silk around legs of the snake guides to secure firm seating. When finished, give the silk a coat of preservative to prevent fading and rotting and to make a base for the varnish.



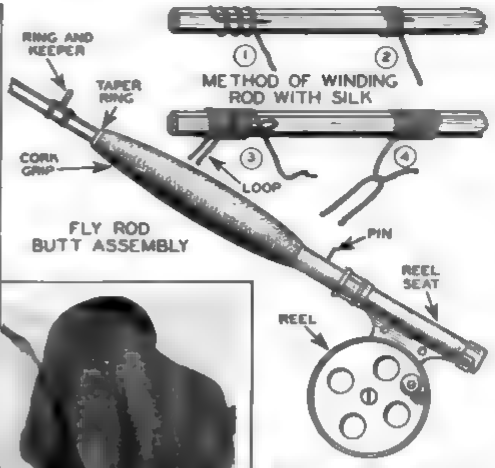



Fig. 7. To make a neat job of the silk windings, employ steps 1 to 4 in drawing at top. It is advisable to attach ring and keeper to prevent hook from running amuck when you are traveling from one fishing pool to another.

With a sharp knife scrape away the sharp edges of bamboo from the shoulder mark to the end of the joint, gradually working down the tenon thus formed until it will slip easily into the ferrule. Then continuing with the knife scrape the sharp edges from the joint above this to the second mark.

### Ferrules Should Make Snug Fit

From time to time try the tenon in the ferrule, working the bamboo down until it fits snugly. Rotate the tenon in the ferrule and scrape down with the knife or with sandpaper the dark spots that appear on the bamboo until a snug, easy fit is obtained.

Warm a piece of ferrule cement, which has the appearance of sealing wax, and rub some on the end of the tenon. Hold over heat and spread out evenly over the surface of the tenon. Heat the ferrule as warm as it can be handled. Then again heat the cement on the end of the wood and push the ferrule firmly in place. Warm the ferrule again with the wood inside and force the ferrule farther on the wood until it is in place.

### Fitting on the Outside Ferrules

To fit the outside ferrule lay the upper end of the butt joint about 1/16 of an inch from the ferrule that has been cemented in place, as shown in Fig. 4 in top drawing. Lay the outside ferrule alongside the joint as shown, and mark on the joint opposite the one prepared an outline of the serrations.

If a ferrule with a shoulder is used it will also be necessary to mark the location of the shoulder. Proceed with the knife, scraping down the edges as in the case of the inside ferrule, and fit and cement the ferrule in place, being careful not to force it too far and leave too little room for the inside ferrule to fit into the outside ferrule its full length.

In the same manner fit the pair of ferrules between the tip and the middle joint. The fitting of the tip, shown also in Fig. 4, at the top, is similar to the fitting of the ferrules. Tips come in two styles as shown in Fig. 3, either the plain or the agate lined, and it is customary to fit one of each kind to the two tips unless the user has a preference for one or the other. Many fishermen prefer tungsten tips, since they have no tendency to chip.

### Securing Reel Seat to Butt Joint

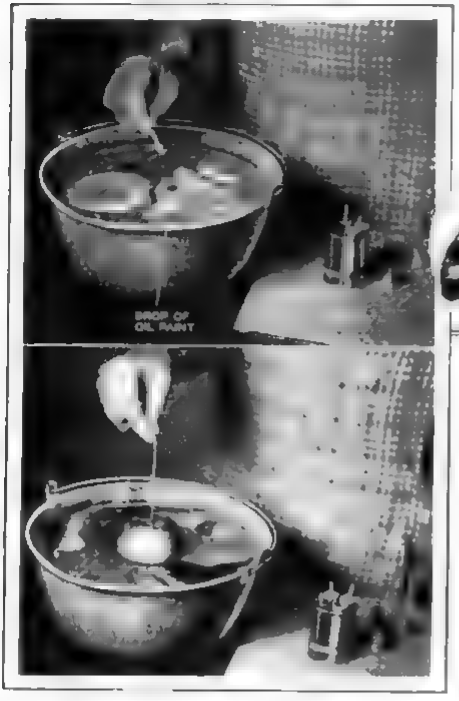
Before cementing the butt to the butt joint it is best to assemble the butt fixtures on the cork handle and core as shown in Fig. 4. If the reel seat fits loosely on the core wrap the core with strips of gummed paper in spiral fashion until it fits snugly.

Place a bit of ferrule cement around the core against the cork grip, warm it and the flared end of the reel seat and push firmly in position. Some reel seats have one or two small pins that may be also driven through the seat into the wood core to help hold the seat in place.

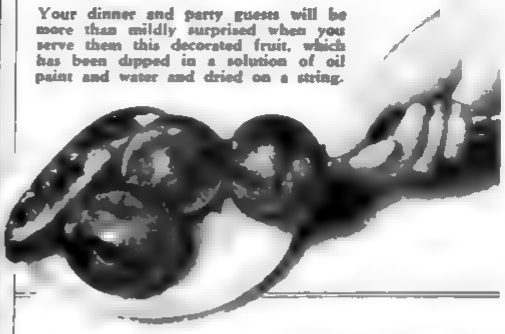
The core and cork grip comes already bored for fitting the butt joint in place. Mark off on the butt of the butt joint the depth of this recess as shown in Fig. 4

*(Continued on page 189)*

# PAINTED FRUIT *Surprises Party Guests*




The oil paint, which is placed on the water with a toothpick, as illustrated at top, spreads over the surface forming unique designs. Fruit is dipped by holding it on string.



Your dinner and party guests will be more than mildly surprised when you serve them this decorated fruit, which has been dipped in a solution of oil paint and water and dried on a string.

IF YOU want to introduce something really novel at your next party or dinner, try serving painted fruit. An orange, banana, apple or other fruit that can be peeled before being eaten will provide no little surprise if served to the guests after being decorated with gay stripes, spots or splashes of bright color.

To do this, obtain small quantities of oil paints of the quick-drying variety. Blue, yellow, red and black will make a suitable combination. Then fill a large pan with water almost to the top and with toothpicks place drops of the oil paint on the water. Hold the sticks close to the surface so the drops do not plunge to the bottom.

The oil will cause the colors to spread over the surface in bizarre patterns that can be complicated by blowing gently across the surface.

When the paint has assumed an interesting design, lower the fruit gradually into the water, twisting it back and forth as it goes down. When it is completely submerged and covered with paint, blow the paint away from part of the water surface to prevent further depositing of color and lift the fruit out.

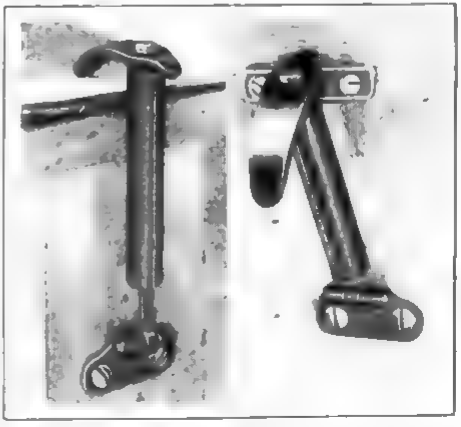
## Old Hood Clip Makes Substantial Door Catch or Bench Paper Holder

HOOK arrangements for holding doors open are not always as efficient as you would like them. A simple home-made fastener which holds the door open—and keeps it open—can be made quickly from an old car hood clip, as shown at the right.

A light metal catch is fastened near the edge of the door to engage the smaller lip of the clip sleeve. The holder should be put near the center of the door, for convenience in using, and just far enough back to afford a firm spring tension when door is open.

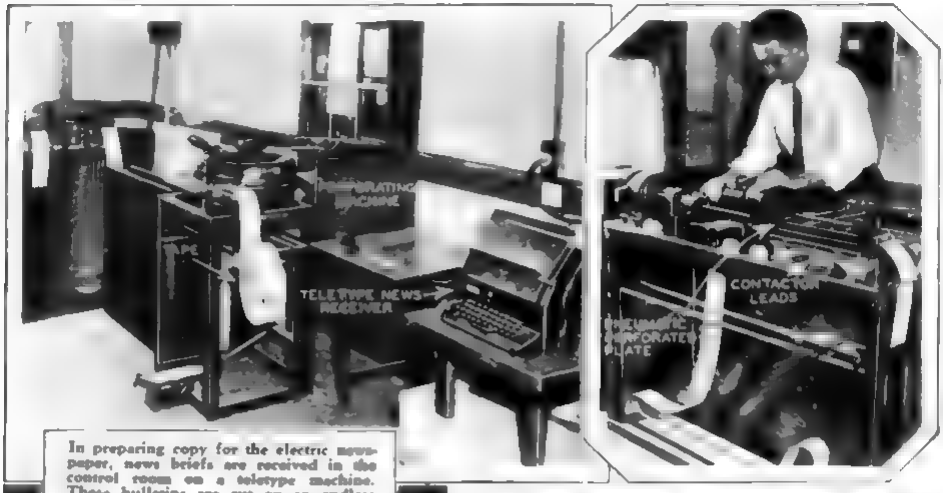
If a short block is nailed under the work bench close to the edge of the end and a clip set so that either end of the sleeve can be raised up over the bench top with plenty of tension, you will have a good vise for holding rolls of paper and other materials when working on them.

One or two of these clips set at each end of your workbench will be found very convenient, as they drop down out of the way when not in use.



Tension of the spring holds doors open and paper smooth.

# News Bulletins Written in Lights




In preparing copy for the electric newspaper, news briefs are received in the control room on a teletype machine. These bulletins are cut on an endless tape by means of a stenciling machine. When fed into the controller, perforated letters are projected on outside screen made of banks of incandescent lights

News briefs are flashed in letters 4 feet high as the sentences move from one end of this board to the other—about 80'.

A UNIQUE news bulletin service, the first of its kind in America, is now in operation in Los Angeles. Local, state and national news in the form of short briefs is printed in 4' incandescent letters which move across an 80' bulletin board, broadcasting the late news flashes every evening from 7 o'clock until midnight.

As the news pours into the office, it is concentrated into short, informative bulletins and flashed by teletype to the office which controls the board. Here a squad of men transcribe the briefs by stenciling machines on wide, endless tapes which, fed into the controllers, project their perforated letters on the screen made up of multiple banks of electric lights.

The effect is that of the sentences moving across the board and around the corner. In this manner, every letter can be read from points where only a small part of the board is visible. It is estimated that 300 separate bulletins can be flashed on the board during the five hours of operation.

## Revised Plan to Get Cheap Power

THE century-old idea of engineers to obtain cheap power from wind has been revived in Germany by a constructor of radio towers. The plan is to equip these towers, or others built like them, with a group of light, efficient windmill wheels. The energy thus generated would be converted into electricity by dynamos attached at the base of the windmill.

## Salt, Pepper From One Container

SALT and pepper are obtained from the container shown on the right by operating the white and black taps, respectively. Screw-top glass bottles are filled by pressing down tap so valve can be pulled out and swung to side. Server has pewter base.

Container dispenses salt, pepper.

# New Metallic Collar Reflects Health Rays of Sun on Face

A NEW apparatus for directing the health-giving rays of the sun to the face, known as the "Rivierasonne," has recently been introduced in Berlin. The device is made out of a thin metal and shaped like a large collar.

The metal collar collects the sun's rays and throws them onto the face by means of a multiple reflector. Being extremely flexible, the apparatus, shown in the photo on the right, can be adjusted to any angle to catch the rays and reflect them as desired.

Health-giving rays from the sun are attracted to this thin metal collar and directed onto the face by means of the multiple reflectors. Flexible metal allows adjustment.

## Model Dynasphere Seats 5 Persons

FOLLOWING the successful trials of his Dynasphere—a huge wheel with a seat inside Dr. Purves, English inventor, has now designed a Dynasphere de luxe, the model of which is shown in the photo below.

The enlarged version of the model seats five persons comfortably in a glassed-in cabin, which remains in an upright position while the outside wheel rolls down the road.

The motive power of the vehicle is supplied by a small engine in front of the driver, which runs on a geared track on the inside circumference of the wheel.

Five persons can ride comfortably in the glassed-in cabin of de-luxe model Dynasphere, a one-wheeled automobile.

## Freak Weather Caused by Sunlight

RECENT abnormal weather in Europe and North America has been matched in the Southern Hemisphere by record rains and floods in South Africa and unprecedented heat in Australia. Weather experts claim the experiences of both continents are related to the same fundamental cause, which is the excess of heat from the sun four to six years ago. This was stored, it is believed, in tropical waters, resulting in unusual currents of hot and moist air.

## Poor Lighting Depresses Spirits

PEOPLE'S spirits may be stimulated or depressed by the kind of artificial lighting that is used. One of the most depressing kinds of lighting is the old-fashioned method in which nearly all the light falls on the desk or floor, while the upper part of the room is in deep shadow.

Brighter light in the top of the room, so that there are no deep shadows and the ceiling is about as bright as any other part of the room, is said to be more stimulating and cheerful.

## Spilless Funnel Has Air Vents

HOW OFTEN, when using a funnel to pour a liquid into a bottle, have you had the liquid spilled over the bottle by air coming up through the neck? That inconvenience is overcome when using the new aluminum funnel shown on the right.

The air vent along the side of the neck allows displaced air to escape freely without stopping the flow of liquid into the bottle.

Vents in funnel neck prevent air from spilling fluid.

# Workshop Smelting Furnace

**Melting brass, copper, or even iron for making patterns or castings is a simple job for this workbench smelting furnace, which gets its air blast from your house vacuum cleaner.**

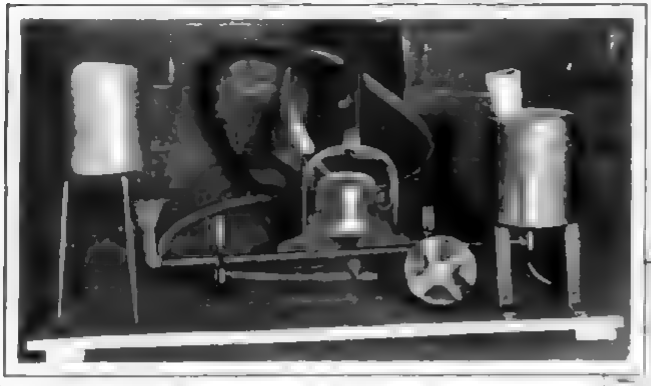


Fig. 1. Here is the completed furnace ready for a smelting job. Flame is governed by cleaner blast and pet cock on the fuel oil reservoir at left.

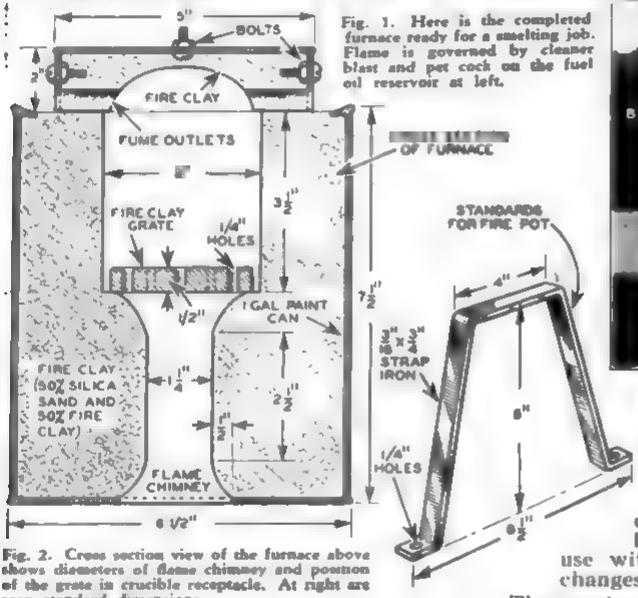



Fig. 2. Cross section view of the furnace above shows diameters of flame chimney and position of the grate in crucible receptacle. At right are seen standard dimensions.

Fig. 3. In making the furnace, set 3-inch bottle in place as shown here, then pour in fire clay, which should be tamped down firmly to form compact mixture. Bottle is removed, leaving receptacle for the crucible.

*by* **WALTER KLOSE**

MANY a shop project has been given up by the home craftsman because the specifications called for several small castings. Small smelting furnaces for this job are not only hard to obtain, but seldom meet the requirements of a home workshop. However, the materials required for building this small "blast furnace," capable of melting brass, copper or even iron, are very few and are surprisingly inexpensive.

The furnace described here can be operated on either oil or illuminating gas. The required air blast is supplied by a conventional vacuum cleaner. The newer types of cleaners are equipped with a blowing attachment and for use with this furnace require no changes.

The construction of the furnace involves the use of fire clay, the successful use of which demands the observance of several simple rules that are clearly set forth in this article.

The essential requirements are: 30 inches of ½-inch pipe, one ½-inch ell, a small funnel, 2 one-gallon paint cans, 6 feet of ⅛"x ½" strap iron, 3 feet of 3/16" by ¾" strap iron, 4-inch length of 1¼" brass tubing (thin wall), 6-inch length of ½" tubing, a small petcock, wad of ordinary cotton, a dozen ¼"x1" stove bolts, and ten pounds each of fire clay and a good grade of silica sand (both of the latter can be bought from a building supply dealer at one cent a pound).

For the firepot mix one part of fire clay

# for Making Small Castings

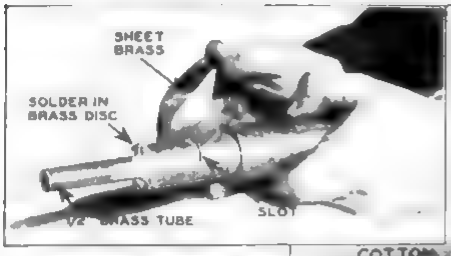
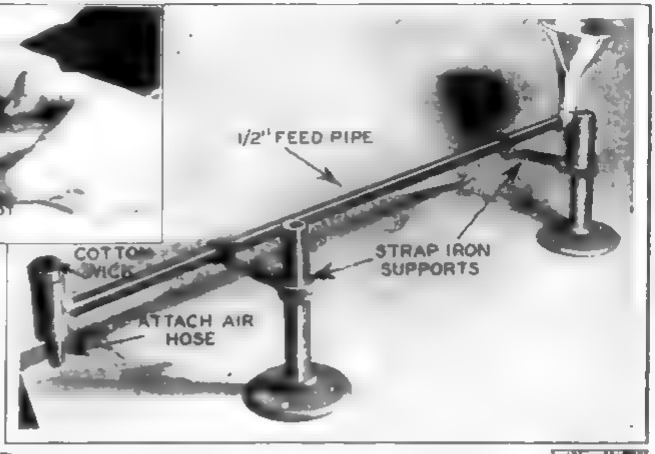



Fig. 4. With this contrivance, the air blast from cleaner can be regulated by closing pipe with sheet brass, which slides into the slot.



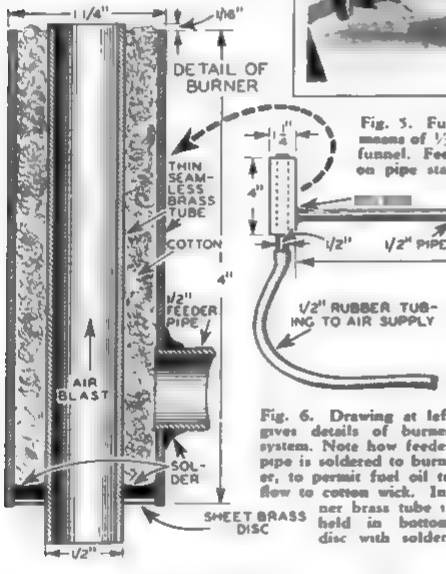




Fig. 6. Drawing at left gives details of burner system. Note how feeder pipe is soldered to burner, to permit fuel oil to flow to cotton wick. Inner brass tube is held in bottom disc with solder.

Fig. 5. Fuel oil is fed to the cotton wick in burner by means of ½-inch pipe, the oil dripping from reservoir into funnel. Feed system is supported by iron braces clamped on pipe standards. Note point of air hose attachment.

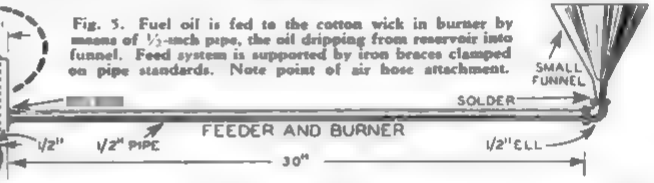



Fig. 7. Here is seen the complete feeder and burner. Air blast for burner is supplied through ½-inch rubber tubing from the vacuum cleaner. Be sure to solder all parts firmly.

to one part of sand and add water until the mixture will retain its form when a small amount is compressed between two fingers. It should not, however, show any tendency to be sticky. If it does it has become too moist to work satisfactorily and will crack on drying.

### Making the Fire Pot

When this mixture has been thoroughly stirred and is of a proper consistency cut a two-inch hole in the bottom of one of the paint cans and fill the can to a depth of three inches with the clay. Thoroughly tamp this solid as demonstrated in Figs. 2 and 3.

The tamping will reduce its depth to about two inches. Roughen up the surface of this tamped mass with a wire to a depth of about one-half inch. This is done so that a bond will be formed with the next batch of clay.

Add another three-inch layer of the clay and repeat the tamping. When a height has been reached three and a half inches below the top of the can, center a three-inch bottle inside and continue the tamping and filling until the clay is flush with the top, as illustrated in Fig. 2.

### Tin Can, Clay Make Furnace Top

The furnace top is made from a section of tin can that has been filled with the same mixture. (See Fig. 9.) Stove bolts are spaced 1½ inches around the circumference of the can to hold the clay tight in the cover. After the clay has dried a concave cavity is cut in the cover for the furnace dome and four half round depressions are cut from the can sides and the clay removed from behind them, leaving four flues for gas outlets when the cover is in use.

A small fire clay grate is made of the same clay mixture used for the dome and the firepot and consists of a circular clay disk about one-half inch thick and small enough in diameter to fit easily into the firepot cavity (see Figs. 2 and 9). It has a number of one-quarter-inch vertical holes in it and the upper surface has shallow trenches dug from one hole to the other, for the purpose of allowing the flame to travel easily over

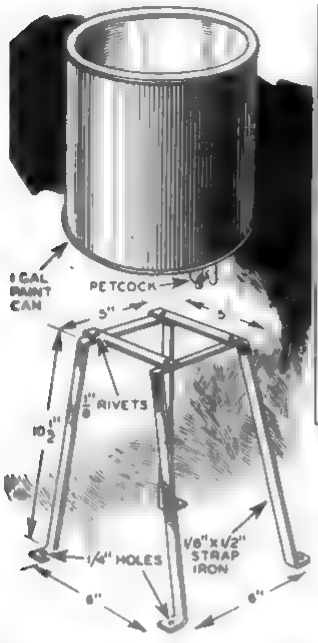


Fig. 8. Fuel oil supply tank should be rigged up as shown in the drawing at left and in drawing above. Pet cock in the bottom of the can governs oil flow. Right — Dome of furnace, made by pressing fire clay in can top.

Fig. 9. This photo shows completed fire clay grate and dome for furnace.

the entire bottom of the smelting crucible when the furnace is in operation.

Returning to the firepot, cut a 1¼-inch vertical hole, extending it from the center of the base to the bottom of the fire chamber. Remove the glass bottle used for a form for this chamber and flare out the edges, both bottom and top, of the hole just made.

At least two and a half inches of this flame chimney must have vertical side walls or difficulty will be experienced in controlling the burner flame.

If care has been taken not to get the clay mixture too wet it is now safe to cover the firepot, top, and grate with a damp cloth and continue with the construction of the remainder of the furnace.

The legs of the firepot are made from two 18-inch lengths of 3/16 by ¾-inch strap iron bent as shown in Fig. 2. These are screwed to a mounting board and form the supports for the furnace.

### Gallon Can Serves as Oil Reservoir

For an oil reservoir the second one gallon paint can is used. A hole is punched in the bottom and a small petcock is inserted and soldered in place as shown in Fig. 8. The leg supports for this container are much lighter than for the main furnace and are bent to shape from two 29-inch lengths of ⅛"x½" strap iron. Fig. 8 also shows this detail.

The oil feeder is built up of a thirty-inch length of ½" pipe. The pipe has a 90 degree ell screwed into one end and a funnel soldered into the other neck of the ell.

This pipe is horizontally supported about three inches from the base board by two clamp standards made of two ½" pipe flanges with short lengths of ½" pipe for vertical supports, and clamps fashioned from light strap iron for holding the horizontal pipe in position. See Fig. 5 for this.

### Oil Burner Simple in Construction

The oil burner, though the backbone of the whole furnace, is very simple in design but shows no tendency to smoke. It consists solely of a four-inch length of 1¼" thin-walled brass tube soldered vertically at one end of the feeder pipe, as shown in Figs. 6 and 7, and with a metal disk soldered in its base.

Through this metal bottom disk another tube of ½" diameter, also of the thin walled type, is centrally soldered in place and allowed to project 1/16" above the top of the outer tube, and also extended one inch below the bottom disk for a connection with the air supply hose. The outside pipe is filled with cotton for a wick, as shown in Fig. 6.

### Adapter for Attaching Vacuum Cleaner

A design for the adapter for the vacuum cleaner hose depends somewhat on the cleaner's design, but a very simple stunt for the controlling of the air blast is shown in Fig. 4. This stunt consists of cutting a brass tube nearly in two with a hack saw and slipping a plate of sheet brass in the slot.

The furnace is now ready to assemble. The only other requisite before attempting to use the furnace is to be sure that all the fire clay parts are thoroughly dry. To be sure of this, it is best to give them a thorough but slow baking of four or five hours in an ordinary kitchen oven.

# Special Gondola Will Try For Stratosphere Flight Record

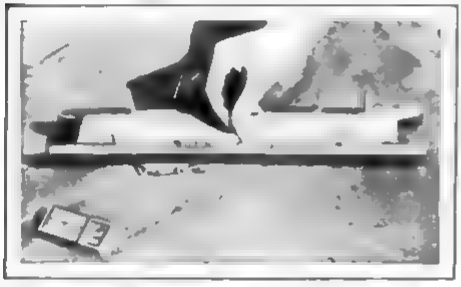
INTENT upon shattering the 10-mile altitude record established by Prof. Piccard last summer, two Austrians, Count Zichy and Hans von Braun, are planning a new flight into the upper atmosphere in the near future.

The gondola in which the sky explorers will make their hazardous flight is shown in the photo at the right. Great structural strength is obtained by use of steel bar framework, which is covered with duralumin sheeting to form the skin of the sky boat.

In attempt to shatter Prof. Piccard's 10-mile altitude record, sky explorers will set sail into the sky in this gondola, which has strong steel bar frame with duralumin skin.

## Play Cribbage While Fishing

FISHERMEN waiting for a bite can while away the idle hours by playing cribbage and the cribbage board can be the rack on which your string is wound. All you have to do is bore the conventional number of holes in the side of the board, as shown below, and use a match stick for a marker.



Make cribbage board by boring holes in side of line rack.

## North Pole Shifts About Globe

CHINESE geologists who have been studying a series of rocks laid down between one million and ten million years ago, have decided that the axis on which the earth now revolves really has shifted slowly during this period, causing changes of climate. By careful study of such signs of past climatic change it may be possible to trace these past shifts of the poles precisely and determine future weather conditions.

## "Terraplaning" on Boards Hooked to Motorbike Proves Thrilling Sport

SURFBOARDS, whose usual habitat is the ocean, have taken to the land in a new sport devised recently by Portland, Oregon, youngsters. The surfboards, made of ordinary planks, are pulled along over the ground at a neat clip by motorcycles, as shown below, and the participants enjoy the sport despite the ever-imminent possibility of a fractured neck, leg or arm. A clean stretch of turf makes ideal course.

In "terraplaning" sport, contestants hook on behind speeding motorcycle and slide over turf on boards as shown above.

# Micro-Telescope Gives Close-up View of Stars, Insects

When used as a microscope, eyepiece is pulled out for focusing and large lens placed near object to be magnified.

THROUGH a new method of co-ordinating the lenses, a prominent eastern manufacturer is now making a new optical instrument that can be used either as a powerful telescope or as a microscope.

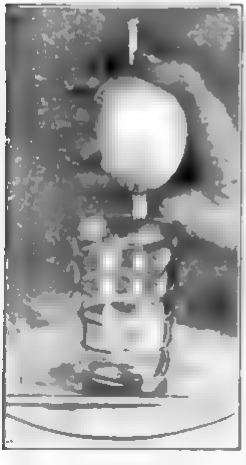
When pulled out to its full length, the micro-telescope brings distant objects eight times nearer. To use as a microscope, the eye-piece is pulled out for focusing, as shown in the photo on the left, and the large lens placed near the object to be magnified. The instrument condenses into a small unit that can be carried in the coat pocket or slipped into a small drawer.

## Water Solution Kills Fruit Germs

THE troublesome household problem of how to get germs off salads and other raw foods without cooking them promises to be solved by a new kind of germ-killing water discovered by a Paris doctor.

The solution is made by passing pure water through a filter of porous porcelain containing millions of tiny particles of metallic silver. The filtrate is pure water containing electrified particles which will kill germs instantly, but are harmless to higher forms of life. The water is safe for humans to drink.

## Device for "De-juicing" Lemons



When fruit is squeezed, the juice flows out lower end of device pushed thru lemon.

SQUEEZING the juice out of a lemon for flavoring foods or drinks is a simple task with the new "de-juicer" shown on the left. The instrument is pushed lengthwise through the lemon with a turning motion. When fruit is squeezed, juice runs into the trough and down into the tumbler. A wooden rod is provided for removing any pulp that seeps through.

Partially tapped lemons will not dry out in ice box; meaning a saving on lemons and a handy garnisher.

## 4-in-1 Tester for Car Drivers

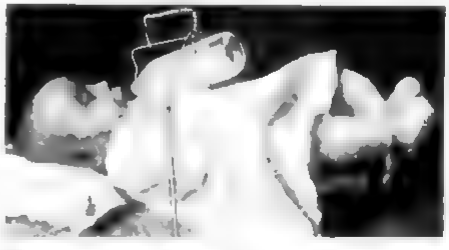
A UNIQUE cold weather tester containing five reading meters will soon be placed on the market. With this instrument, car drivers will be able to test their battery, alcohol, glycerine or anti-freeze solution, and also tell the temperature of the air.

The device, shown on the right, is constructed on the same principle as other testers now in use; the solution being drawn up through a rubber tube into the glass, containing the meters, by the suction created by squeezing and releasing the rubber cup at the other end.

Device will test temperature, battery and radiator fluids.

## Wire Holder for Nursing Bottles

A NOVEL nursing bottle holder has recently been introduced which holds a 4 or 8-ounce small-necked nursing bottle in position over the baby. It is made of 10-gauge wire and bent as shown in the photo below. The infant's weight holds the semi-circular props upright.



Nursing bottle is held above baby by two wire loops on a sliding carriage which allows flexibility of adjustment.

# Things to Make with Tools

Edited by A. NEELY HALL

## A Refreshment Table for Summer Ease

A SERVICEABLE little table, this, for the porch, terrace or lawn, with a refreshment tray and a shelf for reading matter, suggesting and inviting warm weather relaxation.

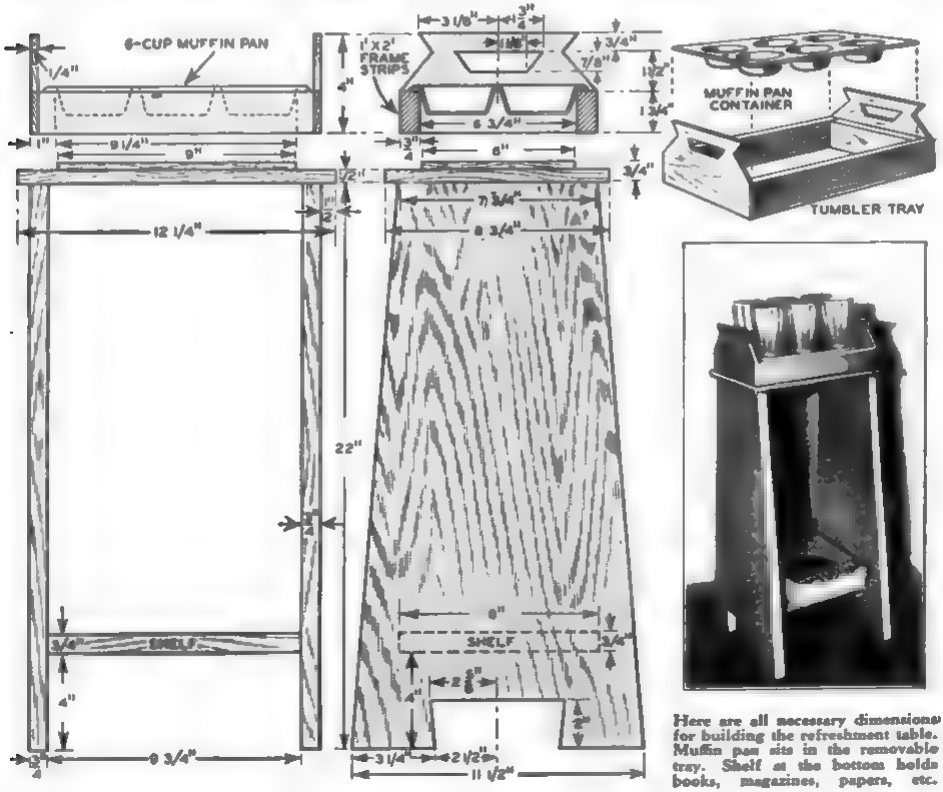
Complete dimensions are given in the drawing below. You will note that the tray has been made removable for serving. The tumbler container is a six or eight-cup muffin pan, procurable at any dime store. The chief point is to make certain that the cups measure 2½ inches across the bottom, inside.

As you will probably want this to be an enamel or lacquer job, use stock with a close grain, such as western pine, fir, cypress, etc. Build the top of the tray first. The plans show how the frame is built of 1-by-2 strips of the right size for the muffin pan to fit in. Use a coping saw for cutting, if you haven't a power or jig saw, and glue and nail the strips together.

The table top has its edges rabbeted so that the tray frame will fit over the center thicker section of the top. Instead of rabbeting the piece, however, you can glue up two pieces of ½-in. stock, or a piece of ½-in. and a piece of ¼-in. stock.

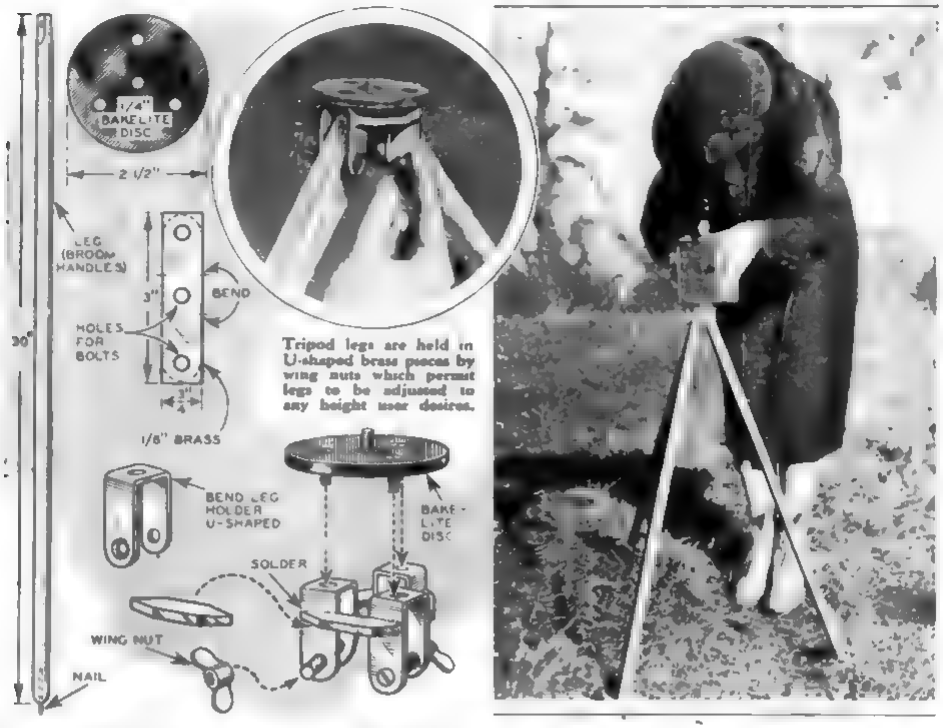
In assembling the stand, scribe lines ½ inch inside the edges of the top board, on the under side, to locate the positions for the end boards. Then glue and nail the top to the boards. Test all corners with a trisquare to make certain that they are right angles.

For a first class job apply two coats of shellac, then put on your enamel or lacquer. Orange makes an attractive finish.




Here are all necessary dimensions for building the refreshment table. Muffin pan sits in the removable tray. Shelf at the bottom holds books, magazines, papers, etc.

# Sturdy Camera Tripod Can Be Made From Broom Handles




Pieces of brass are soldered onto the sides of the three U-shaped holders making them into one piece, which is then fastened to the bakelite discs with three screws. Right—when tripod is set up, nails in bottom of the legs prevent slipping.

THREE 30" broom handles, a couple of strips of brass, a few bolts and a piece of radio panel bakelite will make a sturdy tripod for your box camera, kodak or amateur movie camera.

Complete details of the tripod are shown and explained in the above diagram. The legs are squared off at the top and attached by U-shaped brass strips to the bakelite top.

Greater rigidity may be had by soldering a small piece of brass to the U-shaped connectors, as shown in lower left diagram.

## Ordinary Camera Film May Be Super-sensitized by Ammonia Treatment

ORDINARY camera film can be speeded up by a simple treatment which supersensitizes it to a degree where successful action photos may be taken late in the afternoon or indoors with ordinary illumination.

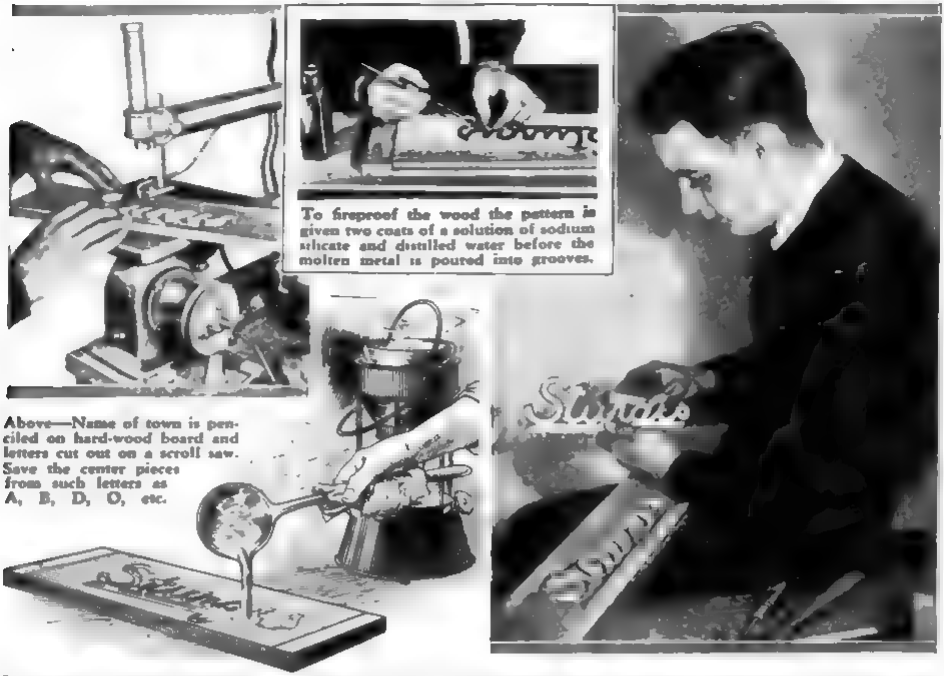
Prepare a smooth strip of board with clips which will hold the film spools far enough apart to expose all the sensitive surface. In a perfectly dark room unroll the film and fasten it to the board.

Brush on the surface a four per cent solution of ammonia until film is entirely saturated. Then hang up the board and turn a fan on it, allowing film to dry in the dark. Finally, re-roll and insert in camera.

The film should be used and developed within a week after this treatment is applied as it loses its speedy qualities after that time.

Film is super-sensitized by unrolling it on a board in a dark room, then brushing on 4 per cent ammonia solution.

# Profits from Metal Name Plates for Cars



To fireproof the wood the pattern is given two coats of a solution of sodium silicate and distilled water before the molten metal is poured into grooves.

Above—Name of town is penciled on hard-wood board and letters cut out on a scroll saw. Save the center pieces from such letters as A, B, D, O, etc.

In making metal name plates for cars the molten metal is poured into the wood pattern, as shown in lower left drawing. Cast is allowed to cool, then tapped out of the pattern, buffed, and painted with transparent lacquer to polish metal.

THE workshopper can make his spare time pay him a neat profit by turning out these metal automobile name plates. They are very easy to cast and every car owner is a prospective buyer. Very often a sizeable market can be built up by turning out the plates for surrounding towns as well.

The first step in making the plates is to select a good, close-grained piece of hardwood to use as a mold. Then pencil the name of your city (or name of the town where your market is) on the wood in script—all letters connected. Next place the board on a scroll saw and cut out the letters, as illustrated in the photo above. Also cut out the center pieces of such letters as A, B, D, O, etc. Smooth off any irregularities with sandpaper.

### Pattern Is Coated to Prevent Burning

Now screw this pattern board securely to another flat board and nail all the small center pieces back into their places in the letters. Mix a quantity of water glass (sodium silicate) with distilled water so that it will spread easily and coat the inside of the mold. After the first coat has been absorbed, add another. This is done to make the wood fireproof.

With the pattern completed we are now ready for the metal. The plates are cast from either scrap lead or type metal. The type metal is easiest to use because it melts quickly, costs only about fifteen cents a pound, and can be purchased at any printing establishment.

In casting the plates, place the mold on a perfectly level surface so the cast will be even. Heat the metal to a molten state and skim off the impurities. When metal is heated to the extent that it will flow freely, pour it quickly into the mold.

Let the metal stand for a few minutes and then turn the mold upside down on a table and give it a sharp tap with a hammer. The casting should fall free.

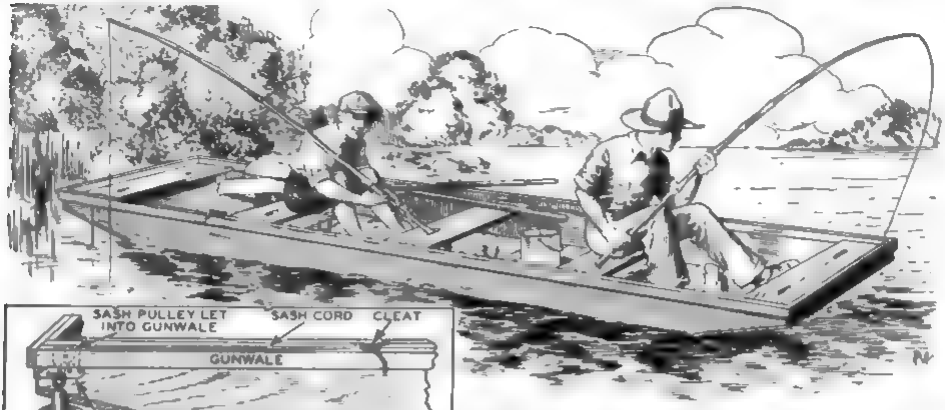
Put the finishing touches on the plate by sanding it smooth, buffing, and coating with a thin, transparent lacquer to give a shiny appearance. It is fastened to the radiator with wire.

## Read Traffic Lights by Shapes

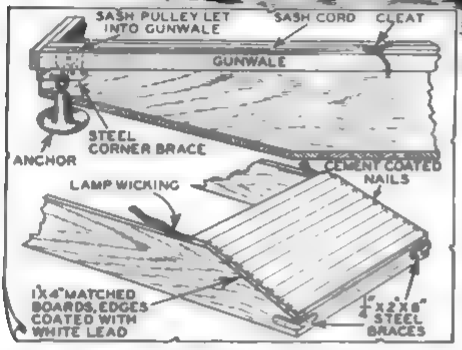
THE British Medical Association is urging the re-designing of traffic lights so that color-blind individuals can interpret them accurately.

One suggestion is that the stop signal be a horizontal bar of light, which may be red. A round spot of yellow light might serve as the caution signal; while a vertical bar of green light would be the "go" sign. Signs would thus be interpreted by shapes of lights.

# Utility Scow Makes Safe PLAY BOAT



Being 4 feet wide and with a flat bottom, this 16-foot punt makes an ideal children's play boat or fishing scow since it can be easily moved about in without danger of tipping.




Strips of lamp wicking and white lead are used, as shown, to make the bottom of the boat as water-tight as possible.

YOUNGSTERS can play "pirates and sailors" to their heart's content in a scow like the one shown above. Being 16 feet long and with a flat bottom, the would-be bandits can move around in it almost as they wish with no danger of accidents or sudden baths which would result in a round-bottomed craft. Then too, the boat is excellent for still fishing and transporting materials.

The sides of the scow are built of cypress, the bottom of fir, and the seats and gunwales of pine. The cypress boards are 14 inches wide — wider than is usually carried by a lumber yard. If the materials are not obtainable there, build up the side boards of two pieces, fastening them together with battens.

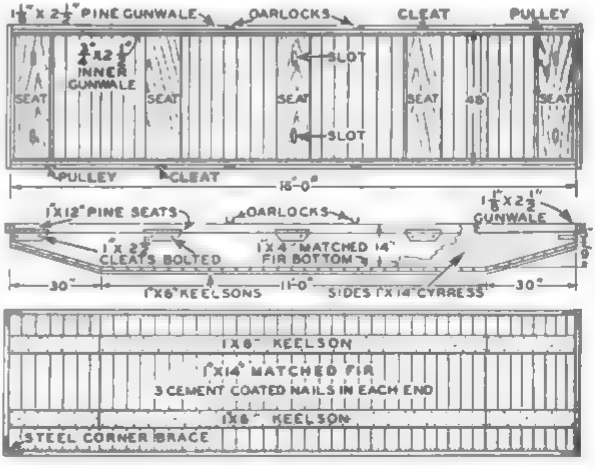
The three drawings on the right give detailed plans for the boat. These will furnish the necessary data to draw up your bill of materials.

There is nothing difficult about the construction of the scow. After the two sides have been shaped, a strip of lamp wicking is laid on each edge—before the bottom boards are fitted on. Cut these boards 48 inches wide and coat the tongued and grooved edges with white lead. Fit them in as tightly as possible using cement-covered nails. These will not rust. At the ends, bevel two boards to make a close-fitting connection.

When the bottom is completed, nail 1x6-inch boards to it, lengthwise, 8 inches from the sides, as shown, for keelsons.

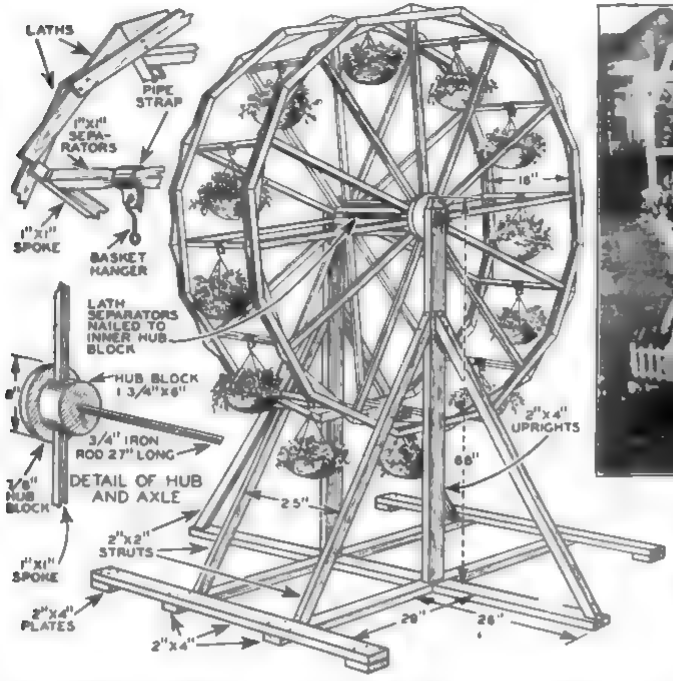
You will notice the novel anchor rigging. This is an optional feature and is installed as shown.

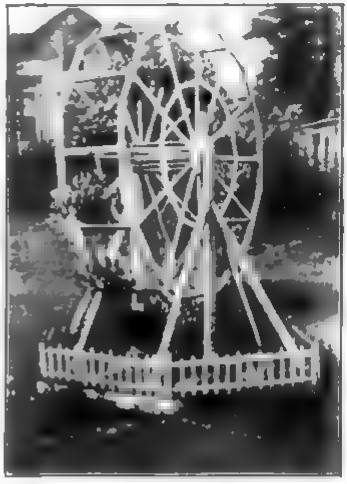
When the assembly is completed, set all nail heads, sand the surfaces, and plane off exposed edges slightly to remove sharpness. Give the boat three coats of good lead paint. After the first coat is dry, putty the nail holes, joints and defects before applying last two coats.




The above diagrams show the top, bottom and longitudinal views of the scow.

# Ferris Wheel Displays Potted Plants



Before starting actual work on the Ferris wheel, prepare a full sized layout of a quadrant on a piece of paper to determine the exact length of each segment. This will also aid in the assembly. Top photo shows a completed job. Basket hangers hook into the pipe straps on cross-pieces holding plants in center of support, as shown in the diagram.

A GROWER of plants will find this model Ferris wheel a novel means for displaying choice potted plants on his lawn. The wheel turns on its axle making it easy to lower the plants for watering or removal.

Although designed for plants, this rig may be adapted to the display of any roadside wares.

Anyone can knock the wheel together without difficulty by following the suggestions and dimensions given in the above diagram. The wheel rims are built of laths, the spokes are 1x1's, the hubs are circular blocks, the wheel connectors 1x1's and lattice strips, and the supporting frame is built of 2x4's with 2x2 struts.

### Draw Layout of Quadrant on Paper

It is necessary to prepare a full-size layout of a quadrant of the wheel to determine the exact length of the rim segments and the angles at which to trim their ends. This will also guide in the assembly. Draw this on wrapping paper, using a piece of string, nail and a pencil for the compass.

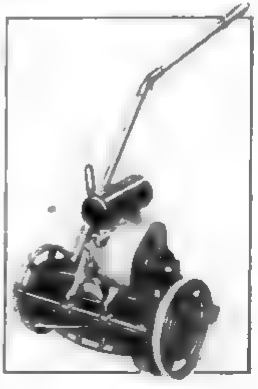
Describe a quarter circle with a radius of 34½" and then another circle 1½" outside of it. Then divide the outer circle into 6 equal parts and draw straight lines through alternate points to locate the positions of the lath segments. Draw lines parallel to and 1½" inside of them, to locate the inner edges of the segments and draw the end cuts.

The wheel requires thorough painting to make it weather-resistant. You will have a more attractive job by painting the inner segment strips of a different color than that used for the outer strips. Make the spokes of a third color and the hub and the midbraces of one of the rim colors. Paint the support the same color as the spokes.

## Power Lawn Mower for Home Use

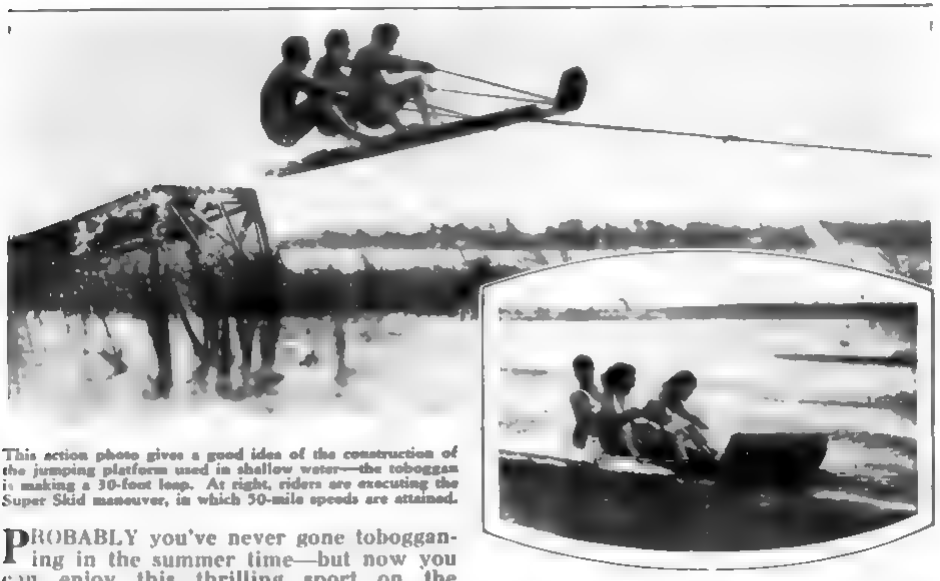
A NEW power lawn mower changes mowing into walking. The conventional roller is eliminated from the 85-lb. machine shown on the right, which is powered by a one-cylinder motor.

An automatic stop-start control is in the handle grip. The motor can be set to run at desired gait and will operate for half a day on a half-gallon of fuel.



One-cylinder motor, operated from handle, powers this mower, which cuts an 18-inch swath.

# TOBOGGAN on the Water



This action photo gives a good idea of the construction of the jumping platform used in shallow water—the toboggan is making a 30-foot leap. At right, riders are executing the Super Skid maneuver, in which 50-mile speeds are attained.

PROBABLY you've never gone tobogganing in the summer time—but now you can enjoy this thrilling sport on the water, using the same type of floating toboggan developed during a successful winter season in Florida. Very likely you've seen movie news reels of some of the thrilling antics performed by the water toboggan when towed behind a launch or one of the larger outboard motor boats.

Toboggan jumping, in which the craft leaps from an inclined platform and sails through the air for 30 feet before it splashes down on the water, represents just about the ultimate in thrills—and best of all, the stunt is accomplished in entire safety.

First study the plan for the toboggan, presented herewith. The bottom should be constructed first, using lumber one inch thick, preferably of cedar, cypress, or Philippine mahogany. Next shape the rounded tin-covered front of the toboggan by cutting out three formers to the shape given in the drawing. Screw these blocks in place, one on each side of the toboggan platform and the third in the center, cleating them to insure solidity.

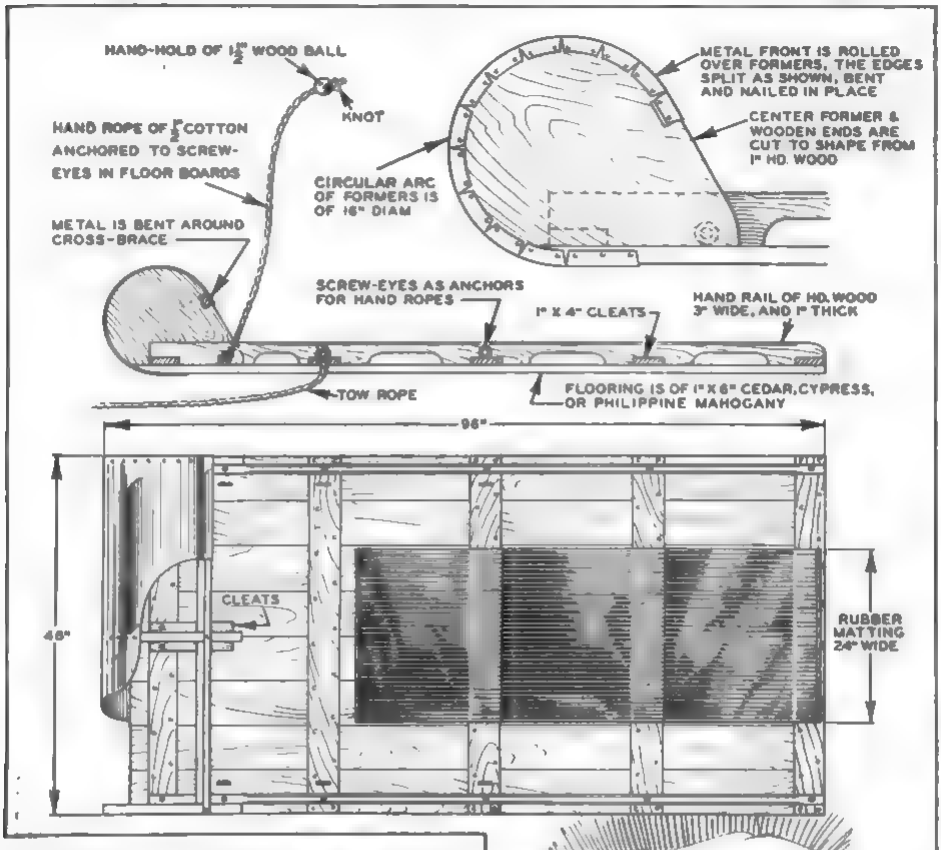
The tin sheet covering, which is slightly over four feet square, to allow for lapping on sides, is then tacked firmly to the bottom and bent in place around the bow. The edges of the metal are split at the sides, approximately every three inches, to allow shaping over the edge of the formers. Tack carefully in place, making sure there are no rough edges to scratch occupants of the toboggan, who will be wearing bathing suits.

Now put on the seat pad, which can be of corrugated rubber sheeting two feet wide by five feet long, or of an old carpet. Use plenty of tacks so the water will not tear it off in case of a spill. Screw

Outboard motor boats in larger sizes or speed launches are suitable for towing the water toboggan as shown in photo.

# This SUMMER

by MALCOLM POPE
*Noted Outboard Stunt Performer*



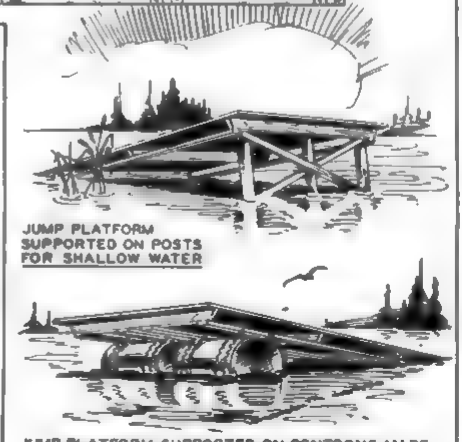

The drawing above shows clearly the construction of the toboggan, which is simple and inexpensive to build if directions are followed.

oh hand rails along the side, of hardwood —the construction of these can be simplified to suit your taste. Sand the wood so there are no rough edges, and then apply a coat of varnish.

Hand ropes should be of cotton rather than hemp, as cotton is easier on the hands. Make them three and a half feet long, with a wooden ball knotted at the end for a secure grip. Anchor the ropes to sturdy screw-eyes fastened securely to the floor cross members.

Install the tow rope, which should be about 30 feet long, and you're ready for a trial trip. Slide the rope up through a hole bored through the center of the first cross member and tie with a single knot on the inside. The tow rope can also be mounted on either side of the toboggan, secured through a cross-member, and joined in a V a few feet in front of the

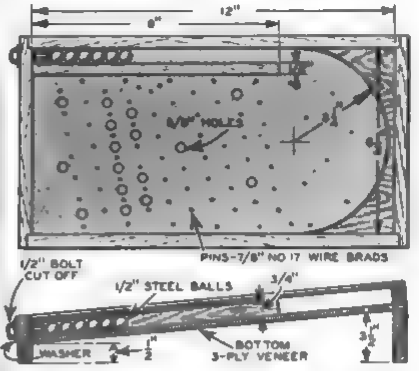
*(Continued on page 191)*



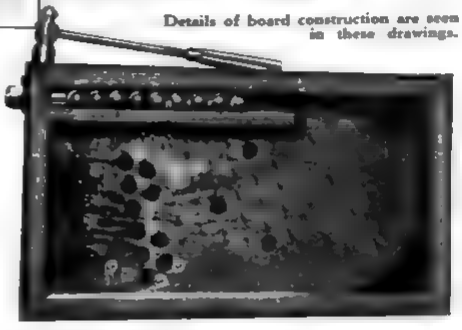

Two types of jumping platforms, one for shallow and one for deep water, vary only in their method of support.

# Test Your Skill on this GAME BOARD

Tapping the bolt sharply with a hammer sends the marbles out of the alley, around the curve, and down the grade.




Details of board construction are seen in these drawings.



Here is the completed board, with marbles in the alleyway ready for a blow with machinist's hammer. Location of holes is optional, but the arrangement above serves well.

REMEMBER that amusement park device where you wallop one end of a lever with a heavy mallet and try to ring the bell at the top of the indicator? Well, that same idea can be tamed down some and converted into a parlor game board without much trouble.

In playing the new game board, shown at the top of the page, a number of marbles or ½-inch steel ball bearings are driven out of the alleyway on the left of the board by a sharp blow with a small hammer on the steel bolt head projecting from the box. The balls roll around the upper end of the board and back through a forest of pins, some of them dropping into the numbered holes.

All the balls are driven out by the tap, but only a few travel any great distance. The score is made by adding up the numbers of the holes where the balls stopped. Those that go all the way down to the bottom of the board without stopping in any hole count nothing.

### Construction of the Game Board

To make the game board, construct a shallow box approximately 1 x 6½ x 12 inches, inside measurements. The thickness of the sides should be about 1 inch. Make the bottom of three-ply veneer, paneling, or similar material that will not split easily.

Mount the box on two supports that need be nothing more than beveled wood boards. The larger support, the one at the top of the board, is 3½ inches high and the one at the lower end, 1 inch high. This gives the proper slope to the box.

In the upper end of the box fit a ¾-inch piece of wood that has been cut with the lower edge concave (see drawing above), the radius of curvature being 3¼ inches.

In the lower left hand corner of the box fasten the driving pin by inserting it through a hole bored in the end at the point shown. This pin is made by cutting a ½-inch bolt to a 1½-inch length and flattening the end. The head rests against a large washer which distributes the shock over the wood, preventing excessive denting.

### Placing of Pins and Holes Optional

After the alleyway, which is a strip ½ x 3 x 8 inches, has been nailed in so that it allows sufficient clearance for balls to pass readily, set up a pin forest of ⅞-inch No. 17 wire brads. The arrangement of the pins and holes is optional, though the layout shown in the diagram is very satisfactory.

The pins should be spaced to allow the balls to pass through easily. A parallel or sloped pattern gives the best results.

Bore the holes with a sharp drill so they will be clean cut. Drill them slightly smaller in diameter than the marbles used. The holes grouped towards the bottom should be marked with the smaller numbers and those nearest the top given the highest values, since they are the most difficult for the marbles to stop in.

A small machine hammer makes a neat mallet for driving the marbles. Experiment and see how many marbles work best on your board.

# SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

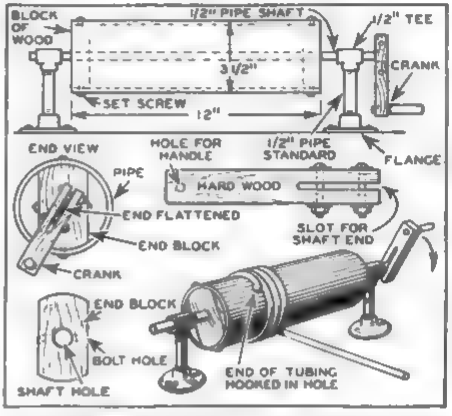
## Winding Heavy Transmitter Inductances

WINDING inductances of heavy copper tubing by hand is a tough job for the amateur, but if there is much winding to be done it would be worth while to make the winder shown in the accompanying drawing.

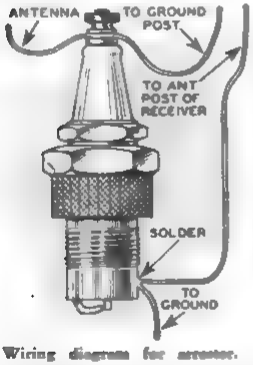
The mandrel for the turning should be about a half inch less than the inside diameter of the coil to allow for springiness. Iron pipe will serve excellently here. It should be sanded down smoothly and bored with four holes, two in each end, to take the screws which secure the pipe to the wood blocks serving as end pieces.

In the centers of these end pieces, bore a ⅝" hole. Then drill a small hole through the width of the blocks to take a pinion that secures the shaft to the mandrel.

The turning mechanism is rigged up as illustrated in the drawing. Note that the ends of the shaft are flattened to take the crank.




Drawing shows assembly of winding machine. When winding is completed, shaft is removed, and tubing taken off.




Wiring diagram for arrester.

### Safe Lightning Arrester Made From a Spark Plug

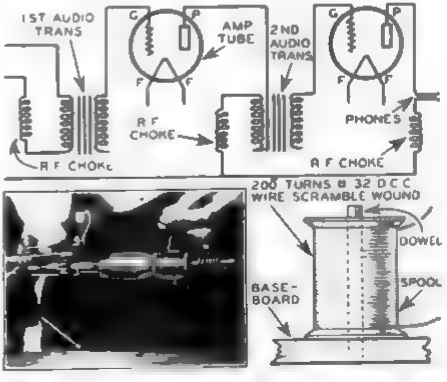
WITH summer, the season of thunder showers and zig-zag lightning, approaching, you'll find yourself in need of a lightning arrester for your receiver. About the simplest, and at the same time most effective, protector you can rig up is made from a spark plug, which is mounted just outside the house near the lead in. Wiring is illustrated in the drawing at the left. The antenna runs directly to the binding post on the plug, and then to the antenna post on your receiver. (Reverse connections shown in drawing.) The ground lead is soldered to the shell of the plug, and runs thence to the ground post on the receiver. When lightning strikes your antenna, the sparking points act as a spark gap to ground the current.

### Fill "Holes" in S. W. Sets

WHEN a radio fan builds a short wave receiver, he is often troubled with "dead spots" or "holes," where oscillation ceases. As a rule you can cure this deficiency simply by inserting R. F. chokes at the points shown in the accompanying drawing.

The chokes consist simply of about 200 turns of No. 28 to No. 32 D. C. C. wire scramble wound on small silk spools. Open the leads of the circuit where shown and solder in the choke leads in series. While at it, introduce a 1MFD fixed condenser across the A battery and across the B minus and detector plus circuit. This will effectively cut out battery noises.

A breast drill, employed as illustrated in photo at the right, will hasten the job of winding, and turn out a neater job in addition.




Circuit at top shows points to insert R. F. choke coils. Wind coil as shown at right.

# Take Your Radio With You

WELL, now that summer is on its way, many of you radio fans who have boats will begin to think about fitting out once more and allowing the radio to slide until next winter.

But why do that? A good radio is just as much company on the water as it is on land; perhaps more so. So why not begin to think about equipping your sailboat, motor boat or even canoe with a receiving set this summer?

Nowadays radios are so sensitive and selective that very little antenna system is necessary. Too, sets are being built for battery operation that are single dial control and will operate off the auto battery or even from dry cells with good volume. So let's see what we can do about putting a radio in the old boat and getting even more out of the summer's cruise than usual.

### Water Contact Makes Ideal Ground

First comes the subject of grounds. Well, that's easy. A ground actually means contact with the earth and the latter includes land or water. Your boat sits in water so what could be easier?

Any large metal surface continually below the water-line will do the trick. For the large motor boat or sailing craft an excellent scheme is to fasten a sheet of copper to the bilge or bottom and lead it right into the cabin to the ground post of the set.

The drawing below shows how this can be done. Cut a strip of sheet copper in a short stemmed T. Make it a half to a third the length of the boat. Fasten the horizontal portion to the hull with copper tacks and lead the stem up to the moulding under the gunwale.

### Ground From Metal Plate on Hull

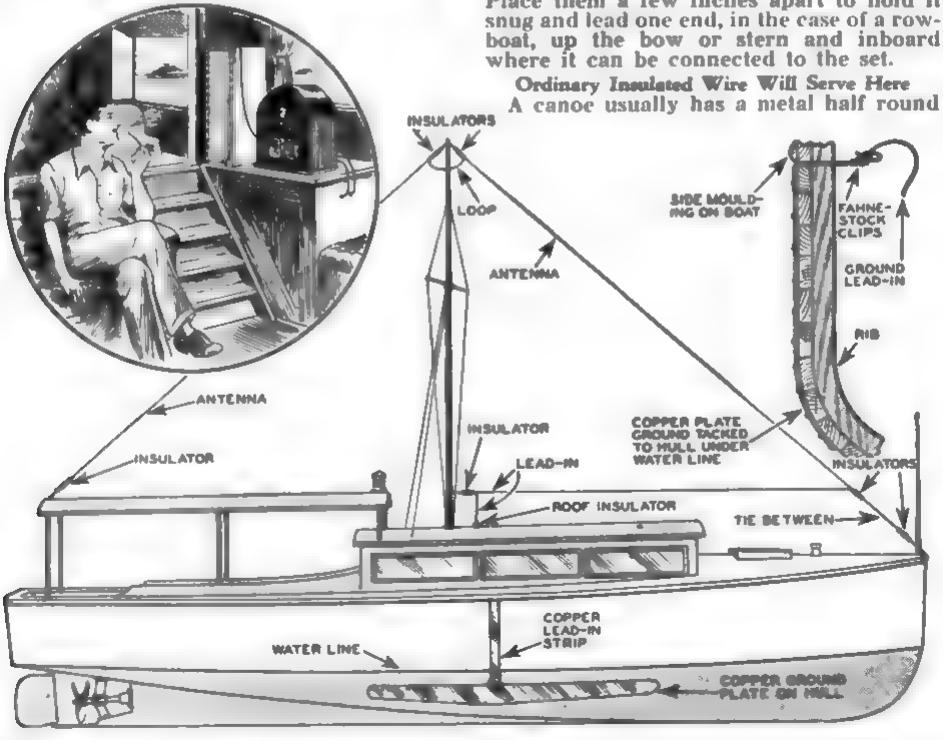
Knock out some of the caulking between two of the planks and, bending the stem at right angles, push it inside, to end in a Fahnestock clip or binding post for the ground lead of the receiver. Then recaulk the seam and paint the copper the color of the hull and it will not be noticeable.

Of course if the boat has a steel hull then there is nothing to do but fasten the ground lead directly to it in some convenient place.

For rowboats, skiffs and canoes an ideal way of obtaining a ground is to turn the boat over and fasten a piece of stiff copper wire to the center of the keel with copper staples, as illustrated on the opposite page. Place them a few inches apart to hold it snug and lead one end, in the case of a rowboat, up the bow or stern and inboard where it can be connected to the set.

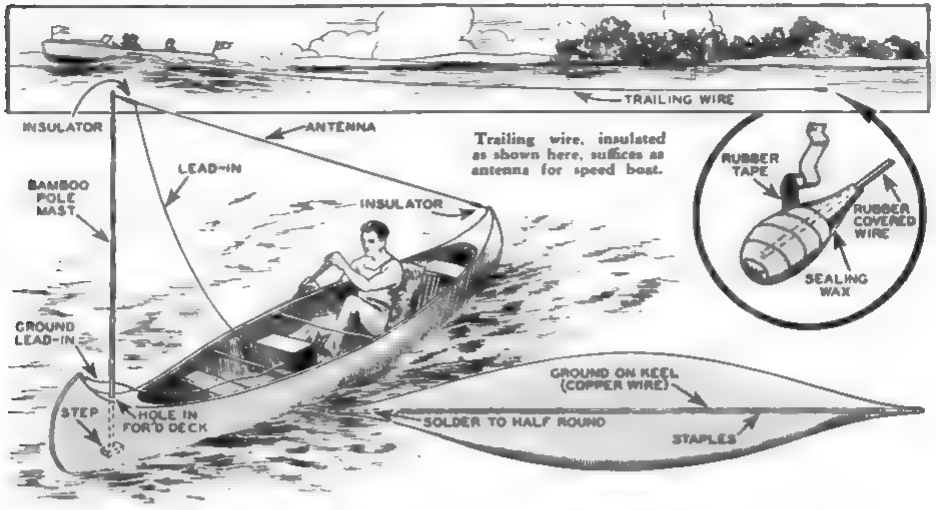
### Ordinary Insulated Wire Will Serve Here

A canoe usually has a metal half round




Antenna for medium-sized power boat is strung up with insulators at points shown in this drawing. An inverted T-shaped piece of copper, tacked to the hull to make contact with the water, forms an ideal ground for operating broadcast receiver.

# on Boat Trips this Summer




Here is best method for stringing up antenna on your canoe. For a ground, fasten length of wire to the keel with staples. Half round of bow will form satisfactory lead to ground post on the receiver. Method works well on all small boats.

extending to the top of the stem from the keel so it is only necessary to solder each end of the keel wire to this and then connect the set to the top end of this metal on either bow or stern.

Now let's think about antenna systems. For a sail or power boat with a mast the thing is greatly simplified. As suggested in the accompanying sketch for a medium sized craft, place an insulator at the stern, two at the mast head and another at the bow. Then insert a short piece of wire or rope at the bow with a second insulator.

From this insulator run a lead to an insulator at the foot of the mast and down into the cabin by means of a water tight insulation lead.

### Antenna for Canoes, Skiffs

For canoes and small boats you can use a bamboo fishing pole mast stepped into the bow with an insulator at the tip. Run the lead-in and antenna from that to the set and to a second insulator at the stern.

An excellent antenna that takes up no overhead space can be obtained by trailing about 50 ft. of rubber covered wire from the stern and in the water. The outer end of the wire must be sealed in sealing wax and rubber-taped to prevent water from coming in contact with the wire inside. This of course works best when the boat is in motion. You'll have to haul in wire when you stop.

No matter what antenna system you use always provide a lightning arrester just as you would for the house. Insurance laws on larger boats require this.

Now let's consider power supplies. For the filaments you can use the starting or lighting battery if it be of the 6 volt storage variety. Just clip the filament circuit to it. The auto type 6 volt tubes are admirably adapted to a marine radio and will work just as nice as in a car.

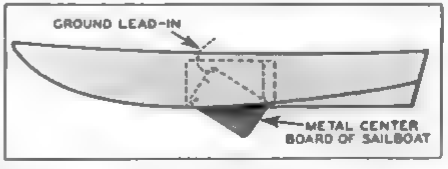
### Power Sources for Receiver

If the boat carries a 12 or 24 volt battery then it will be necessary to cut down the voltage with a power rheostat to reduce it to the required filament voltage. If your motor runs on a magneto only, then you had better use the new 2 volt tubes or 199's and use dry cells for power.

Plate power should be from a bank of B batteries. Three 45 volt blocks of B battery will suffice for any ordinary receiver.

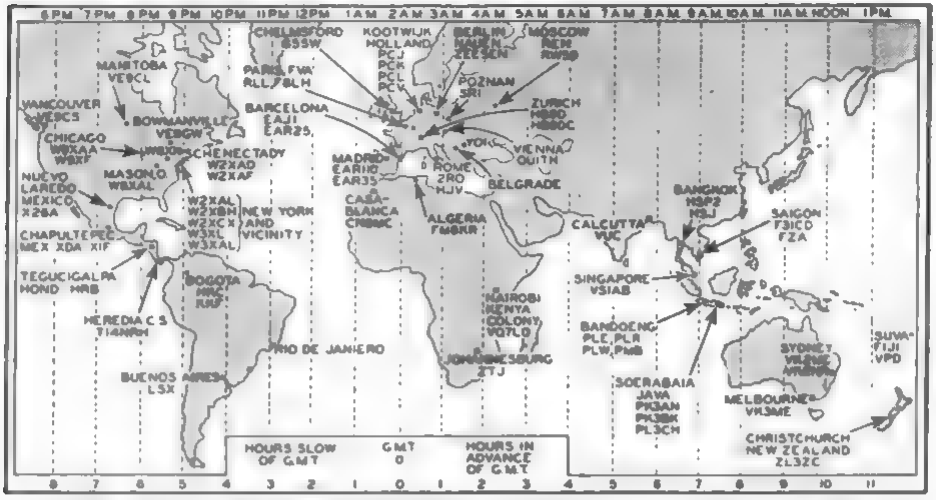
With the advent of auto radios has come the spark suppressor. This is attached between the spark plug and the cable and will effectively cut out all sparking noises in the receiver so that you can cruise about with the engine going and not experience any difficulty about hearing programs.

Short wave receivers operate particularly nice on board boat because even the simplest requires only a very short antenna.




Metal center board of sail boat, making contact with water, acts as efficient ground for your sea-going broadcast receiver.

# Time-Zone Map for Short Wave Listeners




**Reference to the above map shows how you can calculate local time of far-off short wave station you're listening for. In calculating time add hours in advance of, or hours slow of, your local time. For instance if you're in Chicago, and its 8 p. m., to get Calcutta, India, time, merely add 12, giving 8 a. m. Principal world short wave stations are also shown.**

WITH short wave stations coming in from all continents, even on the other side of the earth, listeners in on the high frequencies get confused when trying to figure out time schedules of these far-off broadcasters. Reference to the map above will show at a glance the time zones of the world, so that you can easily calculate the local time of the stations you're listening for.

For instance, if it's 8 p.m. in Chicago, it's 2 a.m. in London, Paris and Barcelona, 4 a.m. in Johannesburg, South Africa, and noon in Sydney, Australia. To compute the time of a foreign station simply add the hours in advance of your time or subtract the hours slow of it, according to the time zone map above.

The map also shows the principal short wave broadcasting stations of the world which you can pick up on a short wave receiver or a short wave converter used in conjunction with your regular broadcast set. Below, these stations are listed according to wave length, call and location.

| Wave-length | Kilo-cycles | Call Letters | Location |
|---|---|---|---|
| 14 29 | 21 018 | OKC | —Podebrady (Czechoslovakia). |
| 14 55 | 20 618 | PMR | —Malabar (Java) |
| 15 5 | 19 350 | | —Nancy (France) |
| 15 93 | 19 350 | VK2ME | —Sydney (Australia) |
| 16 3 | 18 830 | PLE | —Bandoeng (Java) |
| 16 3 | 18 400 | PCV | —Kootwijk (Holland) |
| 16 32 | 18 360 | FZA | —Saigon (French Indo China). |
| 16 57 | 18 105 | W9XAA | —Chicago, relays WCFL. |
| 16 85 | 17 801 | PCV | Kootwijk (Holland) |
| 16 9 | 17,750 | HSJ | —Bangkok (Siam) |
| 16 4 | 16,300 | PCL | —Kootwijk (Holland) |
| 19 0 | 15 790 | EAJI | Barcelona (Spain) |
| 19 72 | 15,210 | W8XK | —East Pittsburgh, relays KDKA. |
| 19 84 | 15 120 | HVJ | —Vatican State, Rome |
| 20 5 | 14 630 | XDA | —Chapultepec (Mexico) |
| 20 79 | 14 430 | VPD | —Suva (Fiji) |
| 21 5 | 13 950 | YOI | —Bucharest University (Rumania). |
| 25 27 | 11 870 | VUC | Calcutta (India) |
| 25 4 | 11 810 | 2RO | —Prato Smeraldo Rome. |
| 25 5 | 11 763 | XDA | —Chapultepec (Mexico). |
| 25 53 | 11 750 | GSW | —Chelmsford |
| 28 2 | 10 635 | PLR | Bandoeng (Java) |
| 28 98 | 10,350 | LSX | —Buenos Aires (Argentina). |
| 29 3 | 10 238 | TI4NRH | —Heredia (Costa Rica) |
| 31 28 | 9 590 | VK2ME | —Sydney (Australia). |
| 31 3 | 9 582 | W3XAL | —Philadelphia |
| 31 35 | 9 570 | SRI | —Poznan (Poland) |
| 31 38 | 9 560 | | —Zeesen (Germany) |
| 31 48 | 9 530 | W2XAF | —Schenectady relays WGY. |
| 31 55 | 9 510 | VK3ME | —Melbourne (Australia). |
| 31 75 | 9 450 | | —Rio de Janeiro (Brazil). |
| 31 86 | 9 420 | PLE | —Bandoeng (Java) |
| 32 26 | 9 300 | | —Rabat (Morocco) |
| 32 85 | 9 130 | HB9DC | Zurich (Switzerland). |
| 33 00 | 9 090 | | —Paris, Radio LL. |
| 34 68 | 8 650 | W2XV | —Long Island. |
| 36 92 | 8 125 | PLW | Bandoeng (Java). |
| 37 2 | 8 060 | OI 4TH | —Vienna |
| 39 0 | 7 890 | PK3BK | Soerabaia (Java) |
| 39 4 | 7 612 | X26A | Nuevo Laredo (Mexico) |
| 39 7 | 7 556 | HKF | Bogota (Colombia) (Westinghouse Labs.). |
| 41 0 | 7 320 | HSP2 | —Bangkok (Siam). |
| 41 7 | 7,195 | VS1AB | —Singapore |
| 42 0 | 7 143 | VK2HR | —Sydney (Australia). |
| 43 0 | 6 970 | EAR110 | Madrid (Spain) |
| 43 0 | 6 970 | PK3BK | —Soerabaia (Java) |
| 43 75 | 6 865 | FSLH | Radio Vitus " Paris. |
| 45 0 | 6 667 | FM8RR | Constantine (Algeria). |
| 45 0 | 6 667 | PL3CH | —Soerabaia (Java) |
| 46 6 | 6 426 | RFX | —Moscow (Relays Trades Union Station) |
| 46 69 | 6 425 | W3XL | —Bound Brook N. J. Relays WJZ. |
| 48 0 | 6,250 | CN8MC | —Casablanca (Morocco) (Relays Rabat). |
| 48.35 | 6 205 | HKC | —Bogota (Colombia) |
| 48.62 | 6,170 | HRB | —Tegucigalpa (Honduras) |

*(Continued on page 188)*


**PICK UP BROADCAST STATIONS ALL OVER THE WORLD ON THE MODERN MECHANICS SHORT WAVE CONVERTER**

**There's a real thrill in radio reception when you listen in down on the short waves. Stations from all over the globe sing in your ears. Especially designed for use with your regular broadcast receiver, the Modern Mechanics Short Wave Converter will bring in most of the stations listed above, along with police squad car broadcasts and airplane pilot-to-airport conversations. Blue prints with complete constructional data on this short wave converter are available for $1.00 at Modern Mechanics Office, 529 So. 7th St., Minneapolis, Minn.**

# Amateur Electrician

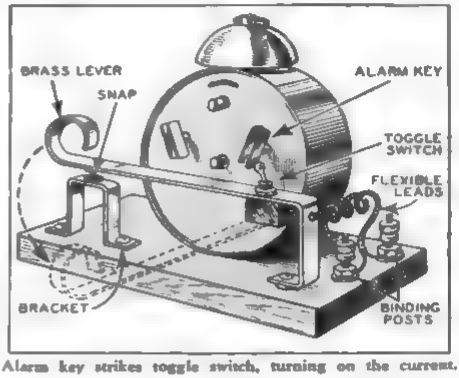
Edited by SEWELL GERMAN

## Alarm Clock Turns on Current at Any Hour

IF THERE'S some electrical device you want turned on at some particular hour of the day or night, here's just the contrivance to do the job, and do it automatically.

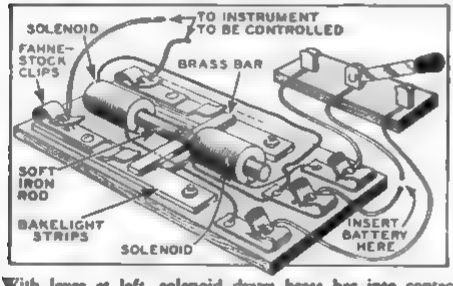
First, secure a reliable alarm clock to a wooden baseboard, as illustrated at the right. Then on this baseboard arrange the brass lever and bracket in the position shown. In one end of the horizontal section of the lever is attached a toggle switch, in such a position that the alarm key can strike it. In the other end solder the snap.

With this arrangement, the alarm key will trip the toggle switch when the alarm goes off, thus turning on the juice to your electrical gadget.




Alarm key strikes toggle switch, turning on the current.

## You Can Turn on Current From Any Distance With Solenoid Switch



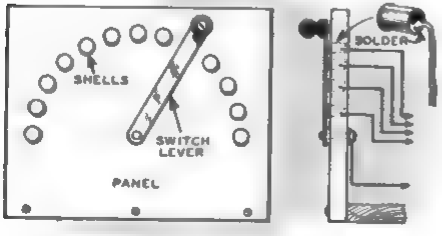

With lever at left, solenoid draws brass bar into contact clips, turning current. Lever at right shuts off the current.

IDEAL for remote control of motors, radio transmitters, etc., is this solenoid switch, made from a few scrap parts. On a baseboard arrange in the positions shown five Fahnestock clips, two strips of bakelite, two solenoids, and a core with a brass crosspiece attached.

The core should slide smoothly in the solenoids. The switch, located at the point of control, is hooked in as shown. When thrown left, the brass bar is drawn up into the two contact clips on the bakelite strips. When the switch lever is thrown to the right, the brass bar is drawn out, shutting off the current.

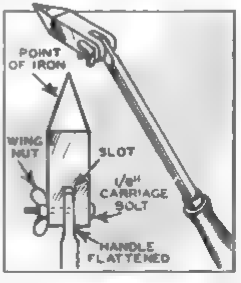
## "22" Shells Make Contact Points

EMPTY shells from 22 calibre "shorts" will make excellent contact points on a rheostat for operating toy motors, trains, etc. Holes on the panel should be made just large enough to hold the shells tightly. After fitting, wires are soldered into the rear, and hooked to rheostat resistors in the usual manner.



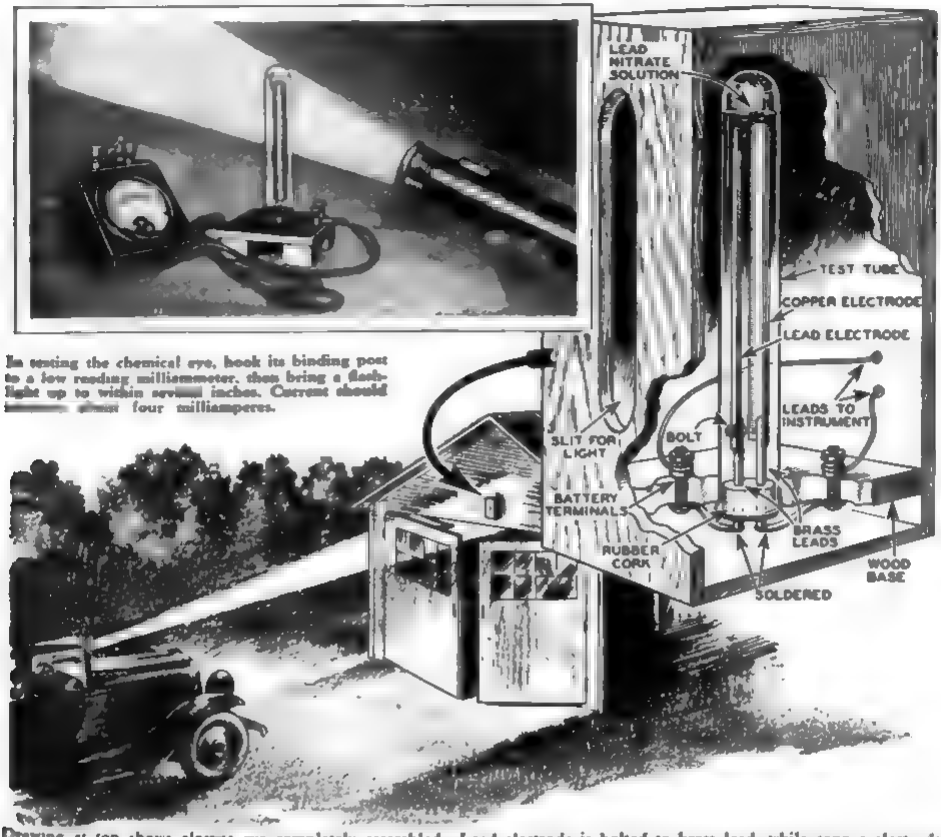

## Solder Iron Has Adjustable Head

FREQUENTLY soldering must be done in awkward corners where it is impossible to work with the ordinary straight iron. For this kind of work you will find it handy to make your iron adjustable, as shown in the accompanying drawing. Round square end of the head, then cut in it a slot. Next flatten the end of the handle to fit in the slot and bore holes for the carriage bolt. A wing nut can be used to tighten the head.




Wing nut tightens soldering iron head at the desired angle.

# Practical "Electric Eye"




In testing the chemical eye, hook its binding post to a low reading milliammeter, then bring a flashlight up to within several inches. Current should increase almost four milliamperes.

Drawing at top shows electric eye completely assembled. Lead electrode is bolted to brass lead, while copper electrode is soldered into slot. Test tube should make a tight fit in baseboard. Eye used as shown will operate motor switch.

THANKS to those inventors who have perfected the photo-voltaic cell, every home experimenter may now experience the thrill of light control experiments by an outlay of not over fifty cents at the most.

The physical form of the cell is shown in the accompanying drawings and photographs. The base piece may be made either of hard wood or of a material like bakelite or hard rubber. The test tube used should be of at least three-quarters of an inch in diameter, with one inch preferred.

At the time the test tube is purchased a rubber cork to fit is also bought and this should have two holes already drilled in place. Every chemical supply house sells such rubber corks and the holes come drilled clean, which is more than the experimenter can do.

The bill of materials is completed with a piece of sheet copper about four inches long and wide enough so that it may be bent in a half circle and placed within the test tube. Then a small piece of lead rod, or a lead strip will be needed for the other electrode.

The brass-rod leads going through the rubber cork should be of such a diameter that they will have to be forced into the holes left in the cork. Otherwise the lead nitrate solution with which this cell is filled will probably leak, inasmuch as the tube is left in an inverted position at all times.

The copper electrode is held to the brass lead from the binding post by solder which is applied only after the lead or brass piece has been split with a hack saw and the copper slipped in place.

Inasmuch as it is impossible to solder lead in the ordinary way, the lead electrode is held to the brass lead-in in the manner shown. This joint should be fitted as snugly as possible to keep the resistance low. After the electrodes have both been put in place,

# does Fascinating Stunts

the portion around the base is painted with asphaltum paint to prevent corrosion.

Before this paint is applied, however, it will be necessary to form a film of copper oxide on the surface of the copper electrode. The procedure is as follows: When clean copper is heated in the flame of a bunsen burner or a blow torch, the copper will gradually turn black through the formation of cupric oxide. Underneath this coating of cupric oxide there is a layer of cuprous oxide which is formed at the same time.

It is this coating of cuprous oxide that is sensitive to light and it will be necessary to dissolve off the surface of cupric oxide with an acid such as nitric or sulphuric before the photo-sensitive surface, which has a reddish crystalline structure, is exposed.

This much done, the cell unit may be slipped in place in the test tube and the top of the tube covered with a thick layer or several coats of asphaltum paint.

### No Expensive Amplifier Necessary

The real feature of this cell is the fact that it may be used without a vacuum tube amplifier, for the current it is capable of generating if the light source is sufficiently powerful is large enough to close a relay of ordinary sensitivity. Indeed an ordinary telephone relay may be used, or a thousand ohm telephone ringer may be converted into a relay that will be sufficiently sensitive for use with this instrument.

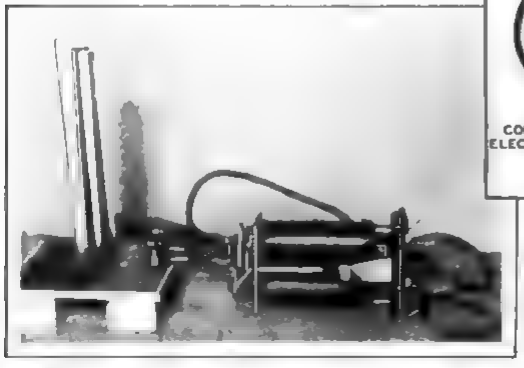
If the experimenter cannot obtain the material necessary to make a relay as described above, any ingenious fellow, removing the magnets from a 2,000-ohm telephone head set, will be able to construct a relay that will close on a current change of at least a milliampere.

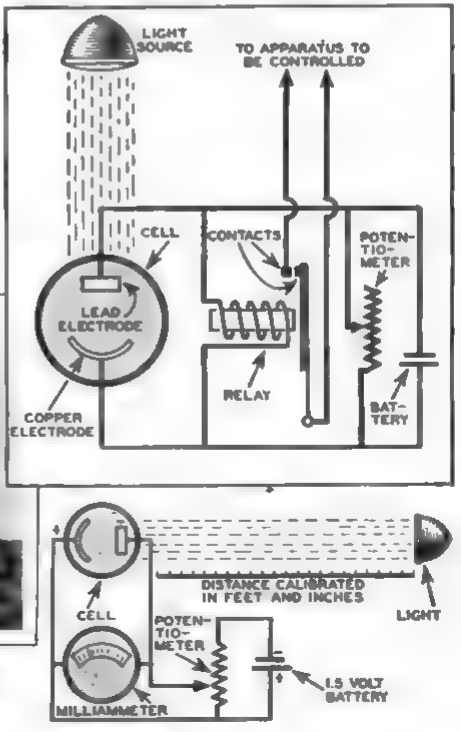
If the builder likes he may also build a container for the cell which takes the form of a wooden box provided with a one-inch aperture for the admittance of light. This would protect the cell from light admitted from anything but an intended source.

It should be borne in mind that most experiments that are possible with ordinary photo-electric cells of the vacuum tube are possible with this. However, owing to the slightly sluggish action of this cell it will not be possible to use it for television.

If a heavy relay is employed in connection with the sensitive one, however, such experiments as starting electric motors by a wave of the hand and doing other tricks that require the use of power may be done.

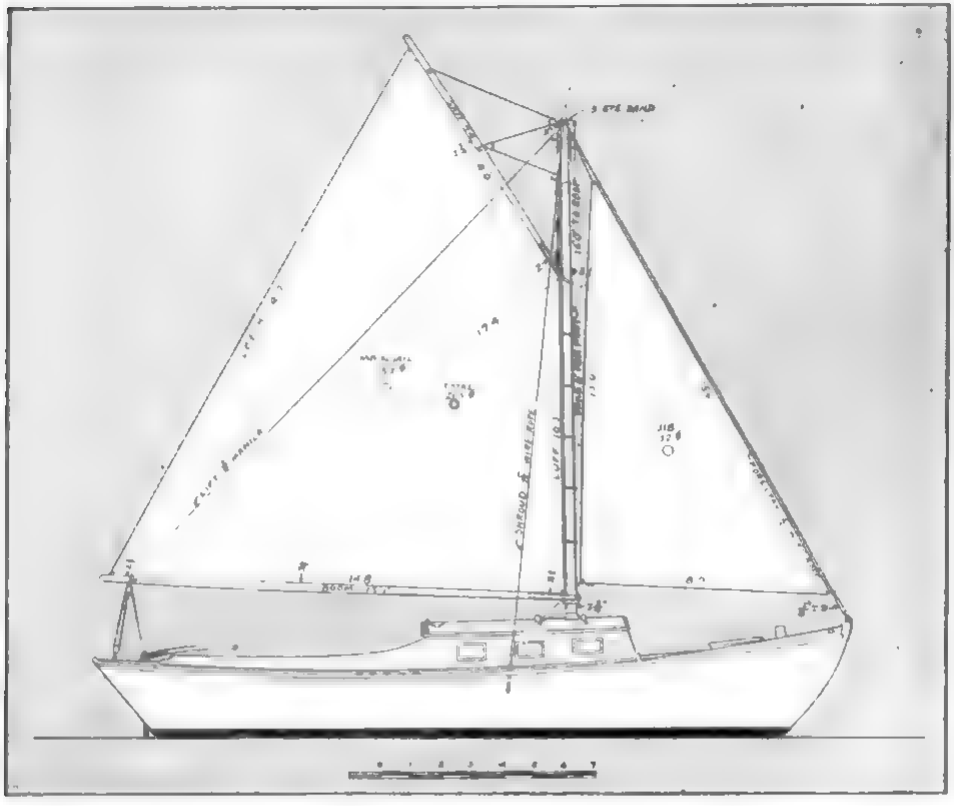
One nice little experiment in the production of musical notes may be conducted by mounting a simple light chopper on the shaft of a small motor. This will be gathered in from the drawing. In such a case, it will be necessary to use ordinary power amplifier of the dynamic type because the current is interrupted at an audio frequency. If a rheostat is placed in the motor circuit and the speed of the motor varied a siren with a very powerful output and a wide range will be produced.






Telephone relay, shown above, proves sufficiently sensitive for use with chemical eye. Top right diagram shows how the relay is wired to eye, while below is seen hook-up for test with milliammeter. 1½-volt dry cell furnishes current.

# More Sail for "DOROTHY"



**Builders of "Dorothy," that popular auxiliary cruiser by Jack Hanna which appeared in our February issue, will welcome this larger sail plan.**

EVER since the plans of *Dorothy* appeared in the February issue of MODERN MECHANICS AND INVENTIONS I have been getting from one to four letters a day, Sundays included, from fellows who are starting to build this great remedy for depression. The surprising thing about their questions is that about one in four asked if they could not use a larger amount of sail, and so lean more heavily on the free air, and less on the joy juice distilled from petroleum.

The letters I get indicate that most of the M. M. gang of grease monks are just a bit hazy in their ideas of how to start in the sailing game, so a little explanation of rigging this sail job seems advisable. First, the mast must be located exactly one foot farther back than for the lug-sail rig. Put double roof beams either side the mast location, and fill in between them with a solid block, through bolted to beams, before roof planking is put on.

Cut mast hole 1" larger than mast, and a little smaller below than on top, so that when mast is in, a lot of little hardwood wedges about ½"x1"x3" can be tapped in all around to hold mast securely. Heel of mast is cut square and tapering to fit tightly in a similar hole in the step block. Be sure to locate these two holes so that the mast will rake or slope backward ¼" per foot, or 4" in 16 ft. This is to aid in bracing it against the forward push.

After the mast is in, sew a strip of canvas around it, secure the upper edge to the mast by wrapping tightly with strong twine, and the lower edge to roof by tacking closely all around with copper or galvanized tacks. Give canvas several coats of paint, and you'll have no leaks around the mast.

Make mast, boom and gaff preferably of spruce, or if you can't get that, the lightest

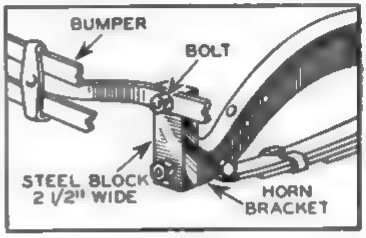
*(Continued on page 178)*

# MOTOR MECHANICS

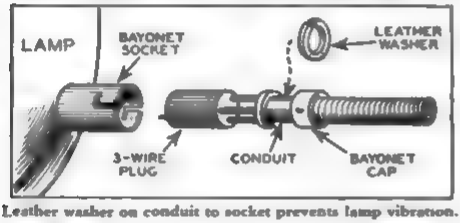
Edited By KAY J. KUNZ

## How to Raise Bumpers to Standard Height

SOME cars are put out with bumpers which are too low to match up with bumpers of other cars, the result being that in the case of a slight collision the driver gets little or no protection. In this situation it's a good idea to raise the bumper slightly. Mounting a steel block on the horn bracket, and attaching the bumper to this bracket, as shown at the right, will do the job. The steel block should be of springy material, about 2½" wide and long enough to raise the bumper the desired amount. A bolt hole at the top takes the regular bolt for the bumper.




### Curing Vibration in Headlights

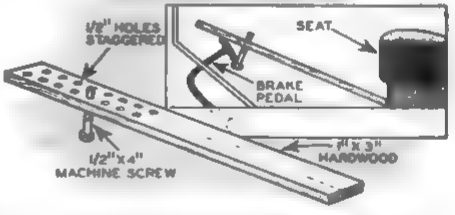



Leather washer on conduit to socket prevents lamp vibration.

ENGINE and road vibration ofttimes produces such heavy wear in the head lamp sockets that cars are frequently seen on the road with lamps which vibrate on and off, causing much annoyance. In the case of a Model A Ford an easy repair may be effected by first removing the bayonet cap from its socket, as shown above. Then place a heavy leather washer around the conduit, against the shoulder, and re-assemble. The pressure induced by the thickness of the washer will hold the parts in close contact and prevent vibration, thus removing the cause of the flickering lights.

### Pedal Jack for Brake Adjustment

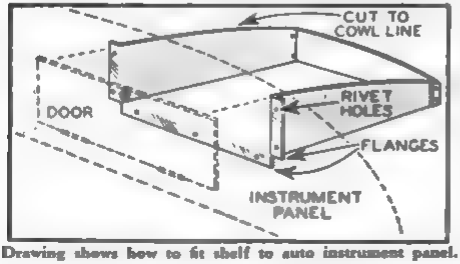
CAR owners who like to do their own brake adjusting on their cars will find the simple pedal jack illustrated above a great convenience. The stunt employs a piece of hardwood about 1"x3", drilled with ½" holes as shown. When using the device, a ½"x4" machine screw will serve to hold the pedal. The threads on the bolt cut into the wood and prevent slipping. Protection for the front of the seat may be provided by a cloth covering or pad at the end of the hardwood stick. Such a stunt will keep your brakes well equalized.




Brace hardwood stick against brake pedal as shown here.

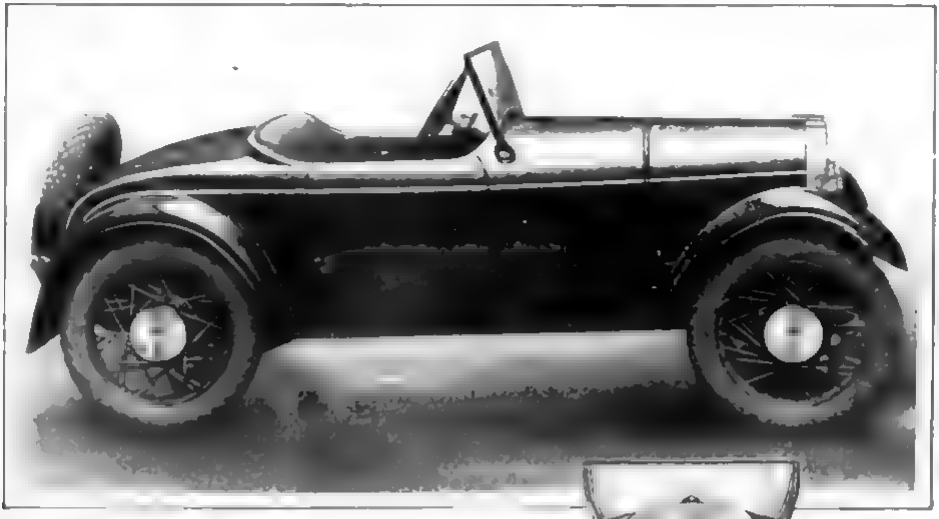
### Building a Handy Parcel Compartment Into Instrument Panel of Auto

MANY fine cars make no use of the space on the instrument panel to the right of the meters, so that it is possible to install here a handy compartment for carrying small objects which otherwise might get lost. First consider the space available, then lay out the opening for the door. A drill will make the start, while the cutting can be done with a hack saw. Next proceed to lay out the box, which may be somewhat larger than the door. The top of the box must be cut to fit the cowl line, so it will be somewhat irregular. When the box has been cut it may be secured to the instrument panel by means of round-headed, nickel-plated screws. Finally attach the door and lock, and a very neat and handy compartment will be the result. Such a stunt is not suitable for a Ford Model A, since the space is occupied by the gasoline tank.




Drawing shows how to fit shelf to auto instrument panel.

# CUSTOM-BUILD *this* M-M



Side view of the M-M Sport Roadster. It has a collapsible top which is dismantled and stored in rear of the car.

Trim, what? The radiator is a dummy designed for appearance, since the motorcycle engine used in the car is air-cooled.

**Here's a "natural"—a car of your own, built to suit your individuality, which costs but a tiny fraction of a factory-built job! Uses a four-cylinder motorcycle engine, seats two comfortably, does 65 miles per hour and holds the road like a Cadillac!**

IN THIS country there are a few automobile factories devoted entirely to the design and construction of custom built motor cars. These factories are oftentimes called upon by wealthy individuals to design and build from start to finish a car which is special in all respects, from the ground up.

The idea of owning a personal motor car embodying your own particular preferences about performance, appearance, and appointments, need not be confined to people with great fortunes at their disposal—provided you are content with the miniature. Almost any mechanically-minded reader may build his own miniature sport roadster, or coupe, or even a tiny sedan, by following the plans presented in this article.

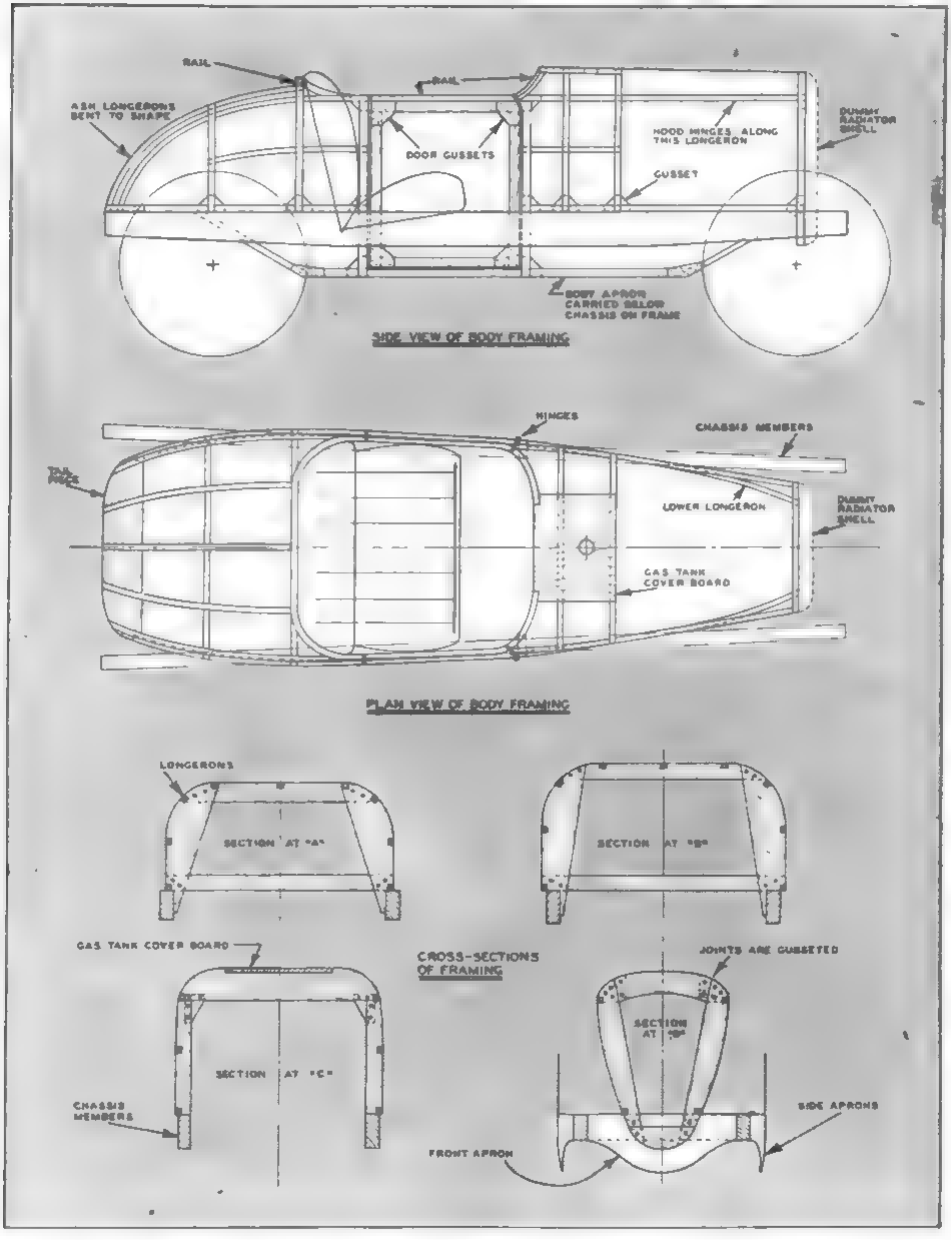
### Motorcycle Engine Used

This diminutive car may be built for a very few dollars, depending upon the ingenuity of its builder. It has a wheelbase of only 80 inches, a tread of 44 inches, seats two comfortably (we show only the roadster design in this article) and it operates smoothly and quietly, using a four-cylinder air-cooled motorcycle engine for its power plant.

Best of all, the car will bear your own name, inscribed upon the radiator shell and hub caps! As you are following the plans given here, you will probably wish to exercise your own creative ability in some features of the design, which will, of course, make it more than ever your own particular make of car—with your own personal preferences embodied in it, as you drive it along the road. When it is finished, it can be enameled or lacquered in your own colors, and by the use of body trimmer's tape and paper patterns, you can work up a snappy color scheme like those found on the four or five thousand-dollar sport roadsters.

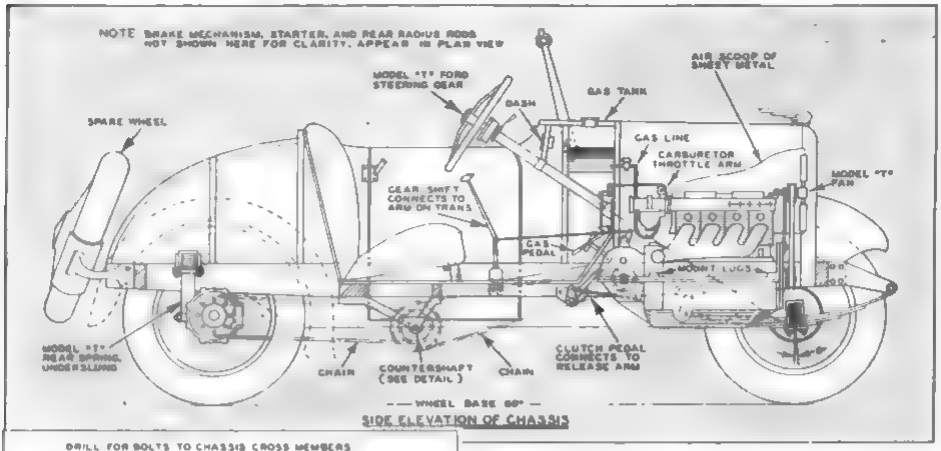
This classy sport roadster is not hard to build -any one can do it who can use tools—and it is not expensive, as you will see upon inspecting the specifications as we go along.

# Sport ROADSTER by THEODORE A. HODGDON

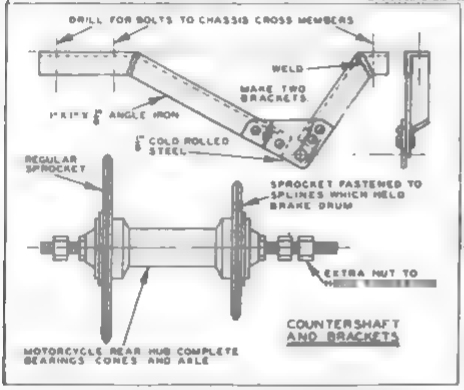



Details of body. Framework is of ash and spruce, shaped with spruce battens, felt padded, covered with fabrikoid.

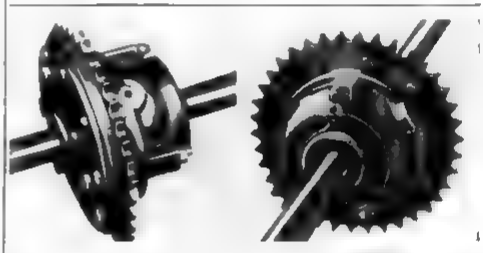
The design and constructional details of this diminutive sport motor car have been carefully worked out so that the whole job may be built with an absolute minimum of machine shop work necessary. There is very little welding, little




This important drawing shows arrangement of engine, gas tank, steering gear, air scoop and other vital details.




Countershaft and bracket detail. Select size (number of teeth) sprockets so that final gear ratio of motor to rear wheels is approximately 5½ to 1 in high gear. Method of determining is explained in the accompanying article.



How sprocket is fitted to Ford Model T differential unit in place of ring gear. Two views of the unit, after ring gear was removed and a 40-tooth sprocket made and bolted in place by same bolts which formerly held ring gear.

or no brazing, the whole job being held together by plates, bolts, screws, and in the case of the body construction, nails and screws, very largely.

A considerable number of discarded Model T Ford parts are used in the construction, as shown in the drawings. The power plant installation is shown and described here in detail. For general road use, such as for running about town, or for a long vacation trip, a four-cylinder, 80 cu. in. motorcycle engine is installed, complete with three-speed gear and reverse, if desired.

Both the Indian 4 and the Henderson 4 are of the unit-power plant construction, so that installation in the chassis is a comparatively simple matter, with only four bolts necessary to hold the entire motor and transmission in place. Of course, these four-cylinder motorcycle power plants depend on air for their cooling and therefore an air scoop with a fan which derives its power from a pulley on the front of the engine, must be fitted, as shown.

It will pull and guide a constant stream of fresh air through the dummy radiator screen, around the cylinder head and manifold, to insure a cool running motor at all times. The construction of these four-cylinder engines is such that unless the air is evenly distributed by the carefully worked out design of the scoop shown in the drawings, heat will develop in the two rear cylinders, which will in the course of a few hours' running under extremely hot conditions, produce a slight distortion, which in turn will cause air leaks and prohibit the motor from idling properly when the throttle is nearly closed.

Many readers may have an idea that this diminutive motor car will operate satisfactorily using as a power unit an old twin-cylinder motorcycle engine, hooked up with a separate three-speed gearbox. However, it is recommended that the builder steer clear of these old twin-cylinder engines, unless they are of at least 74 cu. in. cylinder capacity. The majority of the old twin-cylinder engines which the reader can get hold of for almost nothing will be 61 cu. in. or smaller

—hardly enough horsepower for an engine of this type to properly propel the little car.

Furthermore, these old engines will have gearboxes which were hooked into the motorcycle frame entirely separate from the engine, and more brackets will be necessary than is the case where a unit-power plant of more modern design is used. Stick to the Indian 4 or Henderson 4 power plants complete with clutch and three-speed box all in one unit, and your power plant installation troubles will be simplified. Furthermore, your delivery of power will be smoother, and your installation will be more along typical car lines.

As will be seen by consulting the drawing, the chassis construction is of oak. Two substantial oak longitudinal members, 102" long, and 2½"x5" at the center, tapering to 3½" at the ends, form the main frame chassis members. Cross members also of 2½" oak, with a depth that varies to match the depth of the chassis members at the particular stations where they are installed, are held in place by steel plates of cold rolled ¼" iron.

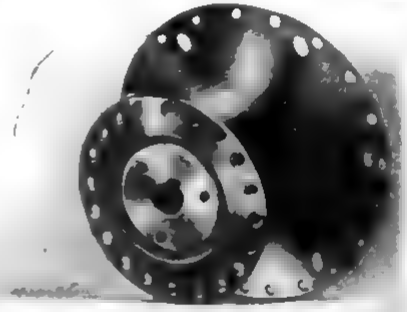
In putting these plates in place, be sure that holes are drilled in the oak of the exact size of the bolt, so that the bolt will be a drive fit both in the steel plate, and in the wood. This is important, because a sloppy fit in these important places will allow the chassis joints to wear excessively under strain.

Exactly the same thing applies to any other location along these oak chassis members where bolts and fittings are installed. Caution should be applied in the fitting of any brackets to the sides of the chassis members. Make sure that you do not bore these chassis members sideways except where absolutely necessary, and then with not more than ¼" bolts.

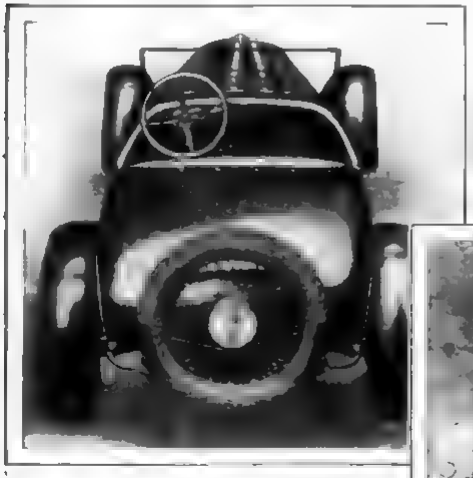
For springing this chassis, a pair of semi-elliptic springs are used for the front axle, while a transverse rear spring holds a differential unit at the rear. It will be possible to pick up your semi-elliptic front springs at almost any parts depot, and if they are too long they should be cut down to the dimensions

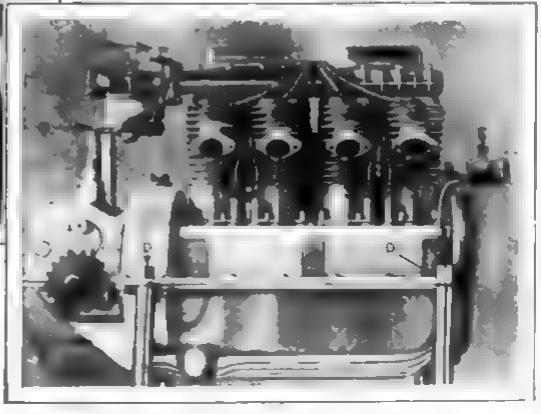
## *Blueprints on the M-M Sport Roadster*

**Large size shop blueprints, made from the original drawings appearing with this article, but done up in large form for workshop use, are available for $2.50 per set. Many builders prefer to work from these large prints because of the ease with which details can be scaled off, the prints being many times larger than it is possible to present them on a magazine page. Address Blueprint Department, Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis, Minn.**



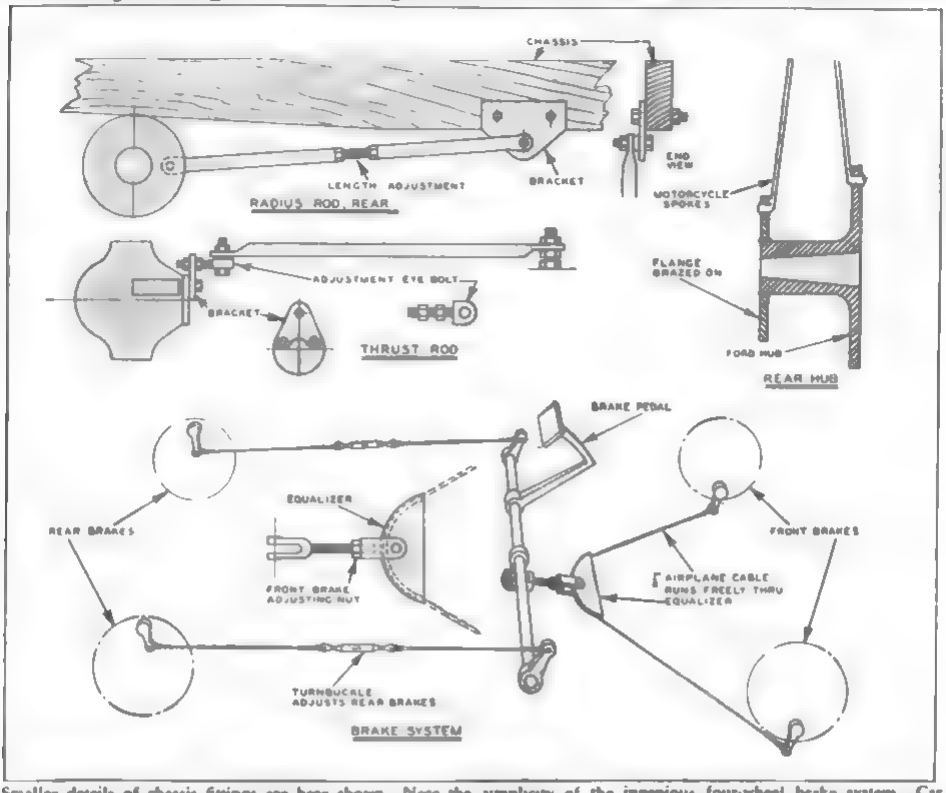
Ford hub flange, as well as flange brazed on, bored with 20 holes for motorcycle spokes.





Rear view of the roadster. At right, view of typical 4-cylinder motorcycle engine, showing elements contained in one unit. A indicates carburetor throttle arm, to which foot accelerator rods are attached; B, gear shifter arm—gear shift rods attached to this; C, clutch release arm on other side of motor for foot clutch pedal attachment; D D, mounting lugs.

## *Brake Equalizing Device Is Ingenious; Other Chassis Details Shown Here*




Smaller details of chassis fittings are here shown. Note the simplicity of the ingenious four-wheel brake system. Car can be easily constructed with a minimum outlay of tools. Chassis is of oak, chosen for easy-working qualities.

shown in the drawing. As is shown, the front ends of these springs are held in cold rolled brackets, while the rear ends must be fitted with a shackle as shown, in order to allow spring action.

For your rear axle, obtain the cross member from an old Model T Ford chassis, complete with the rear spring and differential unit. As may be seen, brackets must be welded to the ends of the cross member taken from the Model T chassis, and the transverse spring must be cut down to the proper length after the differential unit shaft housings have had sections taken out of them on both sides. Please note that these sides are not taken out equally, but follow dimensions carefully so that the differential housing will line up properly with the drive chain from the four-cylinder motorcycle power plant.

The drive from the four-cylinder motorcycle engine to the differential gear is accomplished by the regular motorcycle chain, but owing to the distance between the motorcycle sprocket and the sprocket which is installed inside the differential unit in place of the regular ring gear, it is advisable to install a countershaft approximately halfway between, as shown in the drawing. This will mean that there will be a chain drive from the motor to the countershaft and another one from the countershaft to the "rear-end."

Install radius rods exactly as shown, with the front end approximately even with the countershaft and the rear end securely fastened by means of brackets to the differential housing. This will mean that the centers between the sprockets on your engine and the differential unit will never change, and there will be no danger of chains jumping the sprockets, even when traversing the roughest of roads.

In using a Model T Ford rear end, it is necessary to install three radius rods as shown. The two outside radius rods will take the thrust or tension from braking action when brakes are applied, while the central radius rod will take the pull of the motorcycle chain between the countershaft and rear axle.

Unless this central radius rod is put in place, it has been found in actual practice that the strain of the chain pulling on the sprocket which is fitted in place of the ring gear, will, in the course of a few thousand miles, actually pull the Model T

Ford differential housing to pieces. The study of the action of chains on sprockets will at once show the builder why this is necessary.

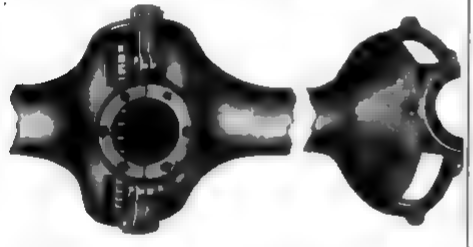
Here it is advisable to mention that the reader will make a mistake if he intends to utilize old motorcycle chains for the drive in this diminutive car. It is recommended that new chain be purchased, and as soon as the new chain has taken its customary stretch after a few thousand miles, it will be possible to take up the slack, and get it to its proper tension, varied by the adjustments on the radius rods (see drawing).

The proper adjustment for both these chains, one from the engine to the countershaft and from the countershaft to the differential unit, will be when the bottom section of the chain may be moved up and down approximately ¾″ with the fingers, and there are no tight spots in the chain, as the drive mechanism is revolved slowly.

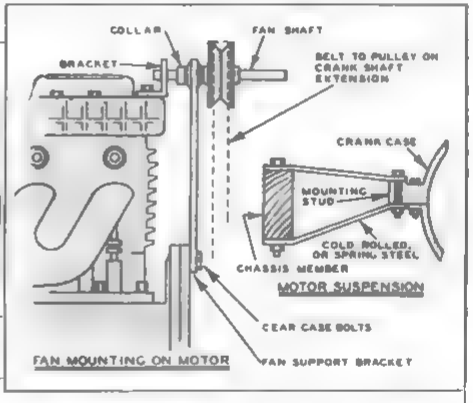
It will be possible for the reader to obtain from almost any automobile parts depot a Ford Model T front axle, from which a section may be cut, to bring the wheel tread down to the proper dimensions, whereupon the axle may be carefully welded together again. The axle is then fastened in place on the two front elliptic springs in approved car type fashion. It will be necessary to have two flat plates welded in place on the Ford front axle, with holes bored as shown, to accommodate U-bolts to hold the front springs in place.

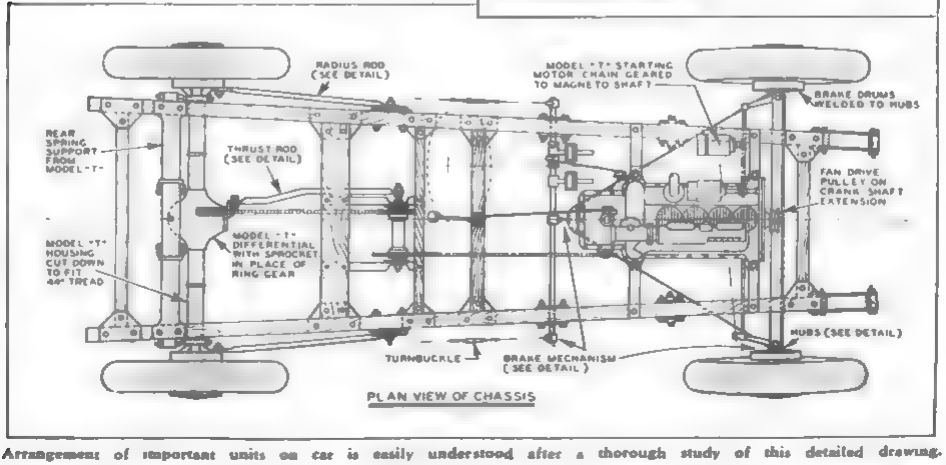
Although it is a comparatively simple matter to obtain an ordinary Model T Ford front axle, cutting a section of it out so that the two ends may be brought together to bring your wheel tread down to the required 44″, bear in mind that the mounting of this axle on the two front springs is extremely important if your little car is to steer properly.

As is shown in the diagram, when this axle is in place on the spring, it should have a castor of not less than 3° and not more than 6 or 7°. This castor is obtained by tilting the axle backwards and placing small wedges between the spring and the axle clamp platform, tightening the U-bolts in place so that these wedges will remain securely between axle and platform. This



How differential housing is cut to allow passage of chain to sprocket—simple slots cut in left half side of housing.




Arrangement of important units on car is easily understood after a thorough study of this detailed drawing.

castor action is necessary if your wheels are to trail properly at speed, and when rounding corners.

When adjusting the cut down radius rod make sure that the front wheels will "toe in" at the front ends ⅛" to 3/16". This is another factor which is important if your car is to steer easily. Still another point to watch in assembling the axle on the springs is that of the wheel camber.

If you put your model T Ford axle back together in welded form so that the steering spindles will be at a slight angle, making the bottoms of the wheels a little bit closer together than the tops of the wheels, you will then be putting in camber which also affects steering. The model T Ford camber is usually about 3° although camber has been known to run as high as 5 or 6° with satisfactory steering qualities.

### Steering Gear Installation

To install this steering gear the radius rods must be cut down to length, and the steering and connecting links also cut to proper length. The steering gear mechanism itself is fastened to a steel plate bolted to the inside of the chassis, as shown in the drawing, and will receive an additional bracing effect from the dashboard of the body, after it is securely in place. (See drawing.)

In using motorcycle rear wheels on this small cycle, it is advisable to weld a brake drum in place on each hub, and connect the brake mechanism as shown by means of an equalizer arm, so that all four wheel brakes operate at a slight pressure of the foot pedals. As is shown, braking operation is achieved by means of steel airplane cables with turnbuckles in place, for proper adjustment of the four brakes. In using these wheels, it will be necessary to refit the motorcycle rear wheels with proper type of bearings in the case of the front wheel spindles and with proper key ways in the case of the rear wheel drive shaft spindles.

### Electric Starter Can Be Used

The chassis should be completed in all details, and should be given a short road trial, before any attempt is made to put the body in place. If desired, electric starting may be added to this motorcycle power plant, by the simple addition of an automobile type starting motor fastened to one of the oak members of the chassis, and driving by means of an electric drive and chain to the magneto drive shaft of the motorcycle power plant, as shown in the drawing.

However, if the reader doesn't desire to go to this work, it is easily possible to start the engine in the conventional way by means of the motorcycle kick starter on the left side of the transmission case. It may be necessary to change the angle of the kick starter by bending it so that when the owner reaches forward with his foot, the kick starter will come within reach and may be depressed exactly as if the power plant were installed in the conventional type motorcycle. However, the electric starter will, of course, prove more satisfactory and add to the convenience of the car as a whole.

An ordinary car type gear shift lever may be fitted to one of the cross members of the chassis, in the proper location, and connected by means of a simple rod to the gear shift arm on the top of the motorcycle power plant transmission. This will give you your three forward speeds, and it will be necessary to install a smaller lever to operate the reverse, which is built into the transmission of certain late four cylinder Henderson power plants.

Many of these four cylinder engines have no reverse gears and no provisions for any, and consequently, the builder will be obliged to do without reverse if he uses one of these power units. However, this is not a serious problem, because the complete car will weigh but a few hundred pounds, and because of its short wheelbase, may be turned in a very short space.

The connection of the clutch to operate in the conventional fashion is a very simple matter, making use of an old automobile pedal free to turn on the tubular shaft cross member, with a rod connecting it to the clutch operating arm on the left side of the motorcycle power plant transmission case.

### Fuel Tank Must Be Added

The carburetor on the four cylinder motorcycle engine is either at the rear or nearly so. It will be necessary to install a fuel tank to hold two or three gallons of gasoline at a higher level than this carburetor on the dash as shown in the drawing. This is a comparatively simple matter, and constitutes gravity feed to the carburetor. An ordinary motorcycle feed line complete with shut off and tank fittings may be soldered into the bottom of your tank, and connected to the carburetor as shown in the diagram. Provisions for an oil tank on the four cylinder motor are not at all necessary because all oil is contained in the crankcase.

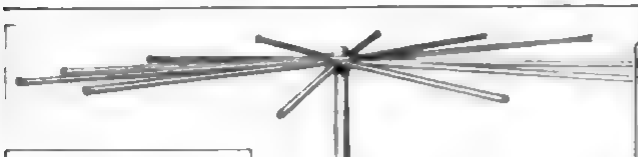
A foot gas pedal may be attached to the footboards in the conventional location, and connected by a simple rod mechanism, to operate the throttle lever on the top of the carburetor. (See drawing.)

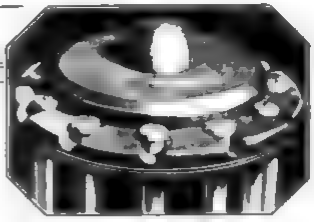
The spark control may be connected to operate from the dash, making use of the regular wire control and cable taken from the motorcycle handlebars, and connecting to a push-and-pull button installed in the dashboard, similar to a "choke" button in an ordinary car.

The choke control on the carburetor may also be simply and easily connected by rods, or by wire control to a push-and-pull button on the dash. By all means give

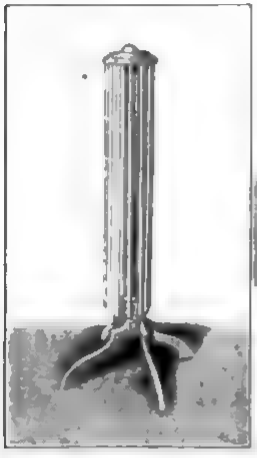
*(Continued on page 173)*

# Folding Rack Replaces 35′ Clothes LINE

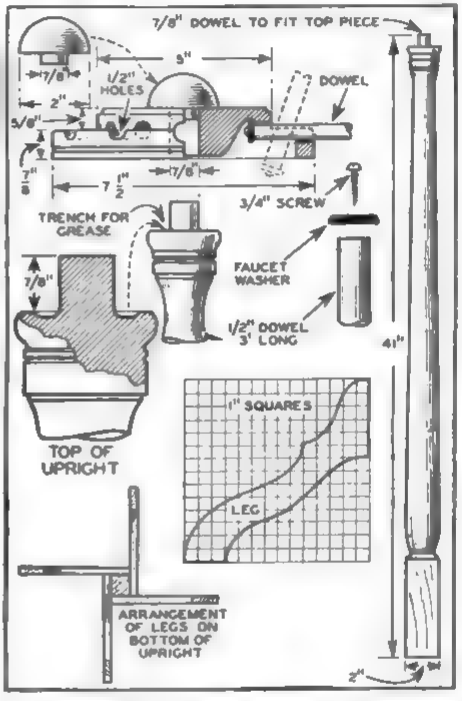




Rubber washers on the ends of the dowels prevent them from falling through the slots.



When the 12 dowels are pulled out for use, as shown above, they will handle as many clothes as a 35-foot line. Left—photo shows how little space the device takes when rods are dropped.




The mechanism of the folding clothes rack is diagramed above. When rod is pulled out, lower end of dowel locks in hub, as shown, holding it in proper vertical position.

THIS folding clothes rack is an ideal fixture for any home where finding space to hang clothes up to dry is a problem. Requiring less than one square foot of floor space when closed, this device will handle as many clothes as 35 feet of line. Because of the large round wood rods, no pronounced wrinkles are left in the clothes.

As a first step in construction of the rack, cut a circular block of wood, such as hickory, elm or oak, 7¾ inches in diameter and from 1⅛ to 1¾ inches thick. Mount this in a center screw face plate and true up. Make a light mark in the center of the edge and divide this circumference into 12 equal parts. Then put a ½-inch bit in the lathe chuck and bore 12 holes, each 1¾ inches deep, justifying this depth by using a stop block.

This finished, turn the piece as shown in the diagram — the purpose being to have a group of elongated slots through which the ½-inch birch dowels will slide easily. However, the bored holes must extend a short distance past the lathe cut to anchor the arms vertically.

### Top Button Is Glued Into Hub

Bore a ⅞-inch hole through the center of the hub. Turn the button as indicated with a dowel which is glued into the top ½ inch of this hole. This leaves from 1 to 1¼ inches of depth for the top dowel to the upright for the pivot bearing.

Turn the upright 41 inches long if possible. The legs should be sawed from 5-ply wood for greater strength and fastened with screws to the sides of the upright.

To prevent the dowels from being pulled out of the slots when rack is opened, and to keep them from falling through the holes when it is closed, mount rubber washers on each end of the dowels.

Before final assembly, make sure that the dowels all slide easily through the slots—one or two may be slightly oversize. If so, either sand them down or enlarge the slots slightly with a small rasp. The upright, legs and hub should all be sanded smooth with No. 00 sand paper before painting to desired finish.

# SPEED-CHANGING *Unit*

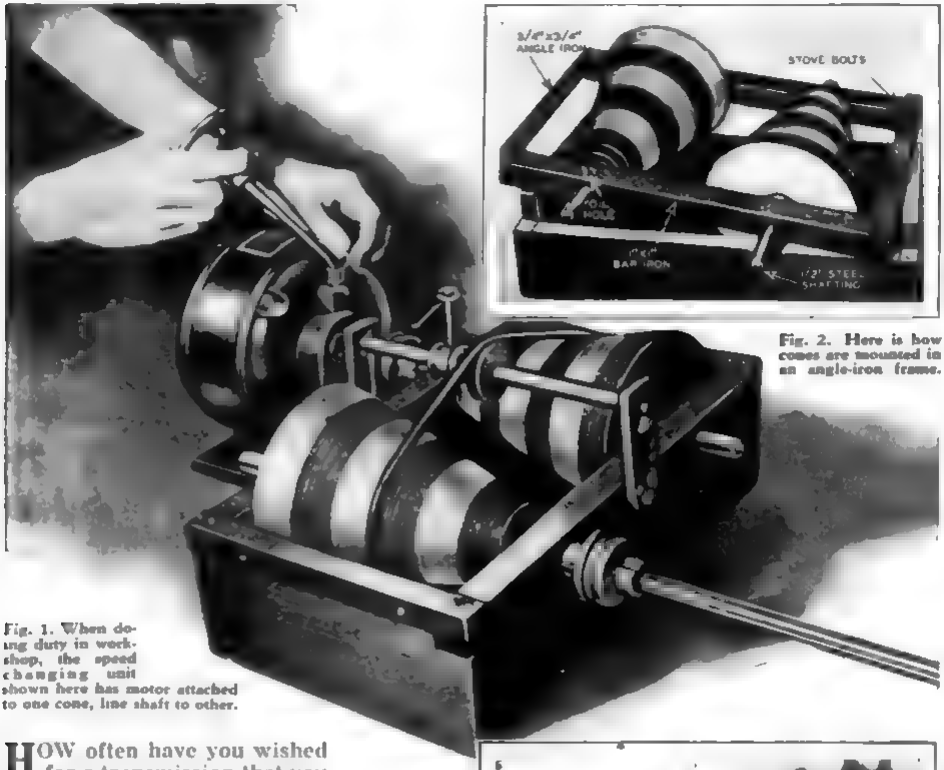


Fig. 1. When doing duty in workshop, the speed changing unit shown here has motor attached to one cone, line shaft to other.




Fig. 2. Here is how cones are mounted in an angle-iron frame.

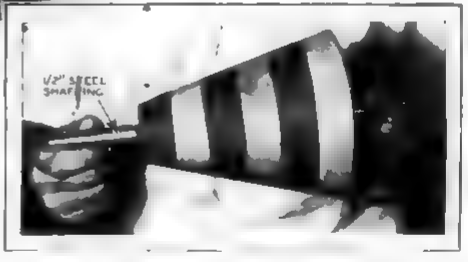



Fig. 3. Wooden blocks are first glued together, then turned down cone-shaped, large end being 6 in. in diameter, small end 2 in. in diameter. Center is bored ½ in. for steel shaft.

HOW often have you wished for a transmission that you could connect between your motor and the line shaft of your workshop, so that you could obtain any speed between wide limits by simply moving a lever—and without stopping the motor?

Such a speed-changing unit is easy to make and more convenient to operate than almost any other type. Its construction, illustrated in the accompanying photos and drawings, is extremely simple, and the cost of materials less than four dollars.

### Unit Built From Two Hardwood Cones

By looking at the above illustrations you will see that the unit consists essentially of two hardwood cones, around which a small round belt runs, the tension on the belt being maintained by an idler pulley which also serves as the speed control. By moving the belt from one end of the pair of cones to the other while they are in motion, the speed can be regulated with practically no loss of power through slippage.

The idler pulley keeps the belt at a definite point, producing a given speed and applying the tension necessary to prevent slipping. Sometimes, when a sudden, severe load is applied to the machine being driven, the belt will slip off the cones and become inactive. This, however, is an advantage rather than a source of trouble, because the belt then acts as a safety valve.

### Determine Desired Speed Range of Cones

The first step in constructing the unit is to determine the speed range desired. The transmission illustrated in Fig. 1 has cones whose diameter ratio, measured at the ends, is 3:1. This gives an overall range of 6:1. Thus, with an 1800-r.p.m. motor driving one cone, speeds ranging from approximately 600 to 5,400 r.p.m. can be obtained.

# for Your Workshop Motor

**Ideal for the workshop is this easily-made transmission, which permits increase or decrease of motor speed by shifting a lever.**

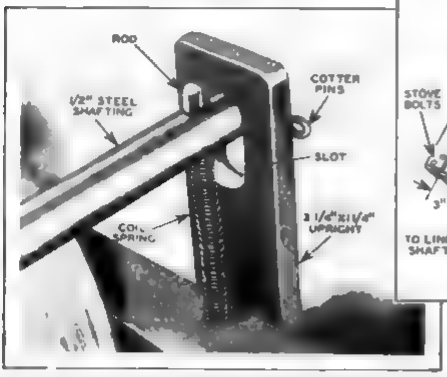



Fig. 4. Belt is kept constantly under pressure by tension of coil spring, which fits over rod passing through the steel idler pulley shaft. Slot in the upright permits play.

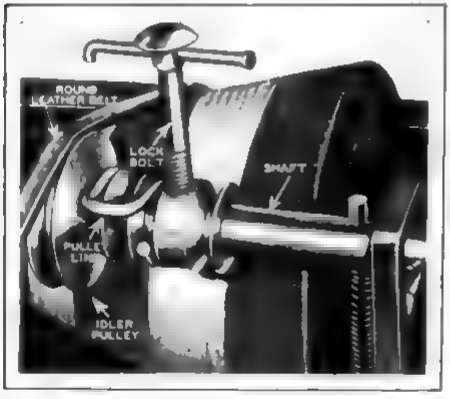



Fig. 6. Speed of the line shaft is adjusted by sliding the idler pulley forward or backward. Tightening down the lock bolt holds the pulley firmly in place, preventing slippage.

If higher and lower speeds are desired, increase the cone length and the maximum diameter to secure a higher ratio. The following dimensions are for the unit illustrated above, but can be altered without affecting efficiency if slope of cone surface is not made too great.

Construct blanks for each of the cones by cutting rough circles from birch or maple stock, boring ½-inch holes through the centers and sliding them on 12" length of ½-inch steel shafting in such a manner that a crude cone is formed.

Glue the pieces into one unit. The surfaces are then turned smooth and sanded,

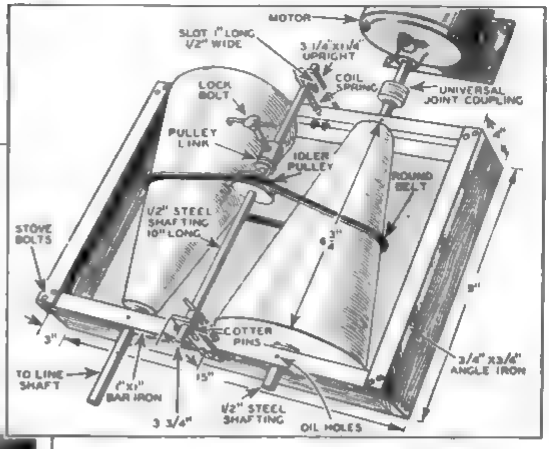



Fig. 5. Assembly of the speed changing unit is illustrated in this drawing. While friction losses are small in bearings used, ball bearings will lengthen life of the contrivance.

all irregularities filled with plastic wood and smoothed to shape. The finished cone should be 6¾" long, 6" wide at the larger end, and 2" wide at the smaller end.

Mount the cones in an iron frame, as shown in Fig. 2, the small end of one near the large end of the other, and their parallel shafts 7" apart. Build the frame from two pieces of bar iron (for ends), each 1"x1"x 15", and two pieces of angle iron ¾"x¾"x 9" (for sides). Bearing holes, ½" in diameter, for the shafts are drilled through the bar iron, each hole being 3½" from the center. Also drill small oil holes about ⅛" in diameter.

### Cross Pieces Made of Angle Iron

Angle iron cross pieces are fastened to the ends of the bar iron strips with stove bolts. Each cross piece has two holes drilled in the vertical surface to receive bolts for holding the frame to a wood base. This base measures 6x15", is 4" high at the ends, and 3" at the sides—the ends extending up between the side pieces.

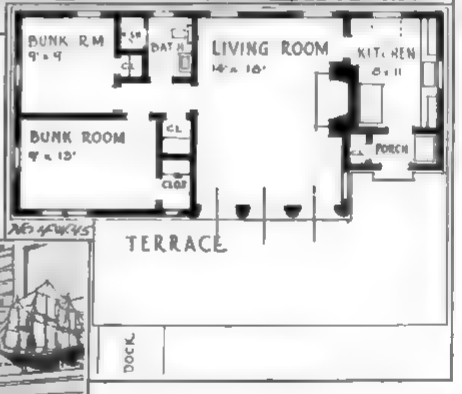
At the mid-point of each of the side bars, drill two horizontal holes. These are used in fastening the two upright pieces that support the idling pulley shaft shown in Fig. 6. Each upright is approximately 3¾"x1¼"x 3/16". A half inch from the top, drill two ½-inch holes, side by side, and cut out the intervening metal to form a round-end slot about 1" long.

Bolt the pieces firmly in place, using lock washers beneath the nuts. Then cut a section of ½-inch steel shafting 10" long, and drill cotter-pin holes a short distance from the ends so that the pins will come just outside of the uprights when the shaft is placed in the slots.

*(Continued on page 170)*

# It's Cabin Time—Here's Two

Plan No. 4-W-45 presents something new in lakesite cabins and is finished in half-round siding which gives it the appearance of a real log cabin. Terrace leads to the dock.




This layout offers a roomy four-room arrangement for small cabins. Bathroom is equipped with shower and kitchen has ample room for sink, table and supplies. Left—Fireplace has extra flue for cook stove.

**A semi-permanent cabin offers a lakesite home that can be lived in almost all year around. Here are two that are small but roomy, and look like log cabins when built.**

THERE'S a lure and back-to-nature appeal about cabins, summer cottages and bunk houses that makes city life seem dull and dreary. Even though they may lack many of the modern conveniences, most owners are willing to forego them. And where is the man or woman who would swap a meal of "ham and," cooked in a snug little cabin of their own, for a five-course dinner at the Waldorf?

With good roads leading almost everywhere, and your favorite campsite accessible in just a few hours, the probability is that your cabin will be in use off and on during the entire year. Therefore, you will want it weather-proof and with enough conveniences to assure a reasonable degree of comfort.

A bathroom or shower is desirable. A fireplace not only adds romance to the cabin but is a necessity; unless you install an airtight heater or Franklin stove. The kitchen should have a lot of shelves and a good sized sink. Adequate light and ventilation are fundamentals. Flexible bunkroom to accommodate extra guests is also desirable. All of these may be had in a small space and at a small cost, too, if, like many cabin owners, you are willing to do some of the work yourself.

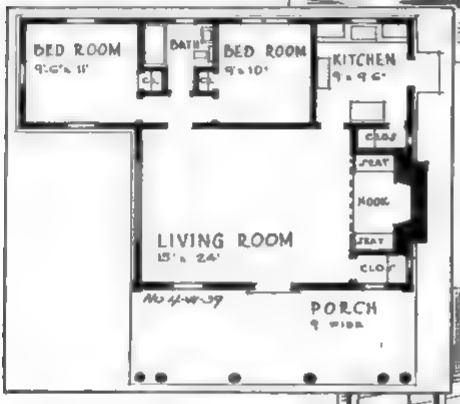
A cabin built from real logs is perhaps the dream of every builder, but unless you live in a region of big timber where logs may be had easily, the cost may prove excessive. Then too, there's always the job of selecting logs of uniform thickness, peel-

# Trail's End BUNK Houses

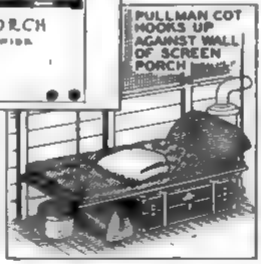
## HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.

This plan, No. 4-W-39, is designed more for a mountain or hillside cabin and can be used for a suburban home.




The special feature of the plan shown above is the novel fireplace nook formed by building benches along both sides. If desired, the porch can be closed in with screen or glass. Right—This pullman cot is a convenient bed for putting up guests. For complete plans for one of these homes mail $1.00 to Modern Mechanics Home Building Editor.




ing, weather-proofing, laying and corking to assure a tight and satisfactory cabin. At best, this is all heavy work and largely hand labor which should be done by experienced log cabin builders.

### Half-round Siding Gives Log "Effect"

However, there is no reason why you cannot have a cabin with log "effects" no matter where you live. Manufacturers are now producing half-round siding which, when applied to the studs as exterior finish, looks for all the world like a real log cabin, and the cost is considerably less.

The two new cabin or bunk house plans illustrated on these two pages were designed especially for MODERN MECHANICS AND INVENTIONS readers. Both may be built of logs, finished with half-round siding, or with battens—which means laying the siding vertical and then overlapping the joints with another strip of siding to achieve a novel effect.

The plans and sketches of the two cabins shown on these two pages being fairly complete, there's not a great deal that needs be said about them other than the fact that they are not only small, compact plans with flexible service features, but also adaptable to different treatment in the way of materials. Even though they are summer cabins, the plans are sound enough to be used for small suburban or urban homes. In that event, you might wish to finish the exteriors with siding or stucco. A small basement would be necessary for the installation of a heater and the house would also require insulation. Cabin plan No. 4-W-45, shown on the opposite page, is a somewhat different type than the usual run of houses. It has been designed for a lakesite and—as illustration shows, is built comfortably near the water's edge with the terrace leading directly to the dock. Three full length French doors open from the living room onto the terrace. The two windows at the opposite end of the living room assure plenty of light and air circulation.

### Small Cabin Has Roomy Arrangement

A feature of the living room is the fireplace planned to accommodate an extra flue for a kitchen range. There are two bunk rooms and a bathroom equipped with a shower. The kitchen is small but offers plenty of space for the sink, table and storage of dry groceries. An ice box is located in the porch entry leading to the terrace.

*(Continued on page 192)*

## Speed-Changing Unit for Motor

*(Continued from page 167)*

The idler pulley rides on the shaft and rotates freely, the shaft remaining stationary. This is a double standard pulley for round belts, and measures about 1¾ inches in diameter at the largest part. The smaller half of the pulley has about a 15/16-inch diameter. Place another pulley, a double one 1" in diameter, on the shaft and connect the two together by a link formed by bending a small bronze or copper rod into a U-shape and wrapping the legs around the adjacent grooves in each pulley.

Remove the set screws from each pulley and into the threaded hole of the smaller one insert a bolt, through the head of which a hole has been drilled and a heavy nail passed for convenience in turning.

Drill two 3/16-inch holes through the shaft so that they will be directly above the centers of the side bars when the shafts are in position. Drill smaller holes in the bars directly below the shaft holes. Place a stiff coil spring of the proper length to exert a constant upward pressure on the shaft, between the shaft and bar, and run a small rod through the center of the spring and into the hole in the side pieces, driving it tightly into the latter. This arrangement, shown in Fig. 4, keeps the belt under a tension.

Cut a round belt of such length that the springs are slightly depressed when it is arranged over the idler pulley parallel to the side bars of the frame. With the belt loose, line up the cone shafts so that they rotate freely in the bearing holes. It may be necessary to grind the holes slightly with a piece of shafting and automobile valve grinding compound.

### Final Check-up Before Starting Up

Lubricate the bearings and attach one of the cones to a source of power. While it is spinning, hold a piece of rosin to the surface until an even coating has been applied. Do this with both cones. Then apply cup grease to the idler shaft, lubricate the link arrangement between the two pulleys, set the lock screw of the speed-changing device, and you are ready to operate the transmission.

The idler shaft will ride about midway in the slots when everything is working well. The springs should be of such size that too much tension is not applied—yet the pressure should be sufficient to keep the belt taut. In the model illustrated, the springs are ¼" in diameter and made of piano wire .035 inches in diameter.

The unit can be mounted in any of several positions at either end of the shaft. If the belt persists in flying off, change the rotation direction of the cones. The pull of the power cone should be on the lower or straight section of the belt. Universal joint couplings are used between the motor and unit, and the unit and machine shaft.

The only improvements contemplated for it are the construction of a wood cover, with a slot for the speed-changing lever, and the substituting of ball bearings for the friction tape used. Ball bearings will add to the cost of the transmission but will repay this in increased life and efficiency.

## Flying Tanks Shed Their Wings

*(Continued from page 37)*

contain all the essentials for flight and consist of wings, tail surfaces, motors, pilot's control room and the landing gear.

The passenger cabin complete would form a second separate unit. Capable of being attached or detached automatically from the airplane unit, this cabin would have the appearance of a large bus or Pullman car and would be capable of independent operation on the ground by means of a light motor driving wheels which would be drawn up when cabin and plane formed a single flying unit.

Such a combination would enable passengers to enter the cabin at a central depot in the city itself, travel out to the field (in extremely large cities where the passenger traffic justified the expense, on special roads) and there be instantaneously attached to the airplane portion of the combination to proceed by air to its destination.

Leaving our baggage at the checking counter, we then repair to the excellent restaurant to obtain a light meal and pass the time until our plane time arrives. As the time approaches for the plane-car to leave we retrieve our baggage and pass through the door to platform No. 5, to see immediately before us a smooth metal bus-like car into which passengers are now pouring. A capable attendant relieves us of our baggage and we enter the car and pass along the central corridor to the small but comfortable observation room in the rear.

Glancing through the windows which surround this compartment, we notice numbers of other plane-cars. Some are standing at their respective platforms, others are arriving or departing through the low doorless exits of the vast hall. At 5:15 to the dot our car glides smoothly forward and we pass out of the hall onto a wide high-speed road which leads directly to the flying field.

Travelling at an even sixty, we arrive at the field to see a number of curious looking planes lined up before the service hangars. They appear to be all wings and tail and are lined up over sets of trough-like tracks which serve to guide the wheels of the cars into exact position as they arrive to be hooked up to the plane units. Into one of these sets of tracks our car wheels presently glide, the car stops and the ground crew busies itself locking the connections into place. A few moments pause and then the motors of the plane, which have been idling as we approach, burst into a mighty roar and in what seems to have been but a few minutes since we entered the car at the central depot we are sailing high over the city on our way to Minneapolis.

Descending at the Wold-Chamberlin airport at Minneapolis our wheels have scarcely touched the ground and the plane approached the concrete apron before the landing gear is retracted, the car wheels extended and the release gear operated to allow our car to shoot forward on the ground once again under its own power while the airplane unit is run into the service sheds to await the car's return with a fresh load of

*(Continued on page 176)*

# "GROUND FLYING"

Banking the turns, zooming up and over hills, then cutting the motor for long, thrilling "dives" down the grades —no wonder they call motorcycling "ground flying!"

In the lightning getaway and flashing speed of a Harley-Davidson are the thrills of air travel without its risks and expense . . . Motorcycling is more than sport and recreation, too, for it

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## IT'S OUT - - The NEW 1932 EDITION of the

# Flying and Glider Manual

YOU'VE been waiting patiently for it for months—and here it is, bigger and better than ever—by long odds the most up-to-the-minute and practically valuable edition of the Flying and Glider Manual ever published. The Penguin Practice Plane, shown at the top of this page, teaches the art of flying and supplies most of the thrills without leaving the ground. Plans for it appear complete in the 1932 Manual, as well as plans for a Ford-Powered monoplane carrying two passengers, which you can build for less than $500—and there are a dozen other plans in the volume.

Nowhere else will you find plans like these—authoritative, complete, lavishly illustrated with photographs and working drawings which make it easy to build your own airplane. Pick any one of the half dozen ships in the Manual and start to build it from the plans in the book—all you'll need will be tools, materials and a workshop; the Manual supplies everything you need in the way of plans and instructions. No use delaying—get your copy NOW!

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A Two-Place Ford-Powered Monoplane
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## Custom-Build This M M Roadster

*(Continued from page 164)*

this chassis a complete road trial before starting to work on the body.

In order to have your custom built job run perfectly along the road at speeds of as high as 65 miles per hour with a four cylinder motorcycle engine supplying the power, it must be geared correctly. If it is geared too high, you will find frequent gear shifting necessary, while if it is geared too low, your top speed will be cut down. On the other hand, it is a common fallacy to suppose that high gear ratios are productive of maximum speed. This is true only up to a certain point. Too high a gear will reduce rather than increase the speed of the machine and will also cause the motor to labor and overheat.

To figure the gear ratios of your car, multiply the number of teeth on the driven sprockets, then multiply the number of teeth on the driving sprockets. Divide the result of the first multiplication by the result of the last multiplication, and the quotient obtained is the correct gear ratio. The driven sprockets are the large countershaft and rear wheel sprockets, while the driving sprockets are considered the motor and small countershaft sprockets.

For example, suppose your motor has a sprocket of 15 teeth, while your large countershaft sprocket has 40 teeth, your small countershaft a sprocket of 20 teeth, and the ring gear sprocket in the differential, 40 teeth; here is the method of knowing just what the ratio, in high gear, will be:

$$\text{Gear ratio} = \frac{40 \times 40}{15 \times 20} = \frac{1600}{300} = 5.3 \text{ to } 1$$

The design and construction of a home-made body offers to a majority of builders a particularly difficult problem. It is a very simple matter to throw together a crude body which will serve to house the motor, driving mechanism and the occupants of the car, but such a poorly appearing body will afford little pleasure for the owner of the car inasmuch as it at once identifies the job as a home-built job rather than a custom built, modern, small car.

It will be seen by regarding the photographs closely, the body on this tiny car does not resemble a home built job, but rather takes on the appearance of a special custom-built factory job. At the same time it is roomy enough to seat two people comfortably, and by means of a collapsible roadster top, with side curtains, will offer ample protection when necessary.

This body is constructed of ash and spruce framework, carefully shaped with spruce battens, well padded with felt, and finally covered with a fine grade of fabrikoid. The hood is of 24 gauge sheet iron hinged in two places as shown in the drawings. It will probably be possible for the builder to procure an old automobile hood, using portions of it by cutting it down.

Note carefully the bulkheads which form the cross section contours of the body, and also

*(Continued on page 174)*

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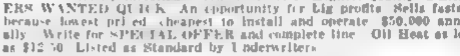

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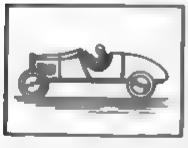
Chassis of the trailer is built up out of a front-axle unit from an old car—almost any type will do. Cost of construction is kept at an absolute minimum; no elaborate tool outlay is required.

Blueprints giving details of construction are large size, easy to understand, all dimensions plainly shown. Scores of these trailers have been built with complete satisfaction to their owners. Price of blueprints, postpaid . . . . . **$1.00**

## Ford Speedster Body



Racing body for a Model T Ford or similar chassis. The simple wooden frame is covered with chicken wire, a layer of cotton batting placed over it, and the whole held down with a covering of Fabrikoid, or imitation leather, which makes the job look like one of those custom-built imported French models. Choose any color combination you like. This body has a streamlined tail like the big-time speedway racers. Hammer and saw and a few small tools are all that are needed to construct it. Looks like a million dollars, but can be built at an insignificant cost. Price of blueprints . . . . . **$1.00**

Many other plans for boats (sail and power), airplanes, log cabins, home-built autos, etc., are available from the Blueprint Department of Modern Mechanics and Inventions. All prints are genuine blueprints for workshop use, made on tough paper in large size—ideal to work from. Address orders and inquiries to

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## Custom-Build This M M Roadster

*(Continued from page 173)*

note carefully the locations of these bulkheads on the oak chassis. After these bulkheads are firmly in place, the ash longerons should be fastened in place by 3/16" carriage bolts, as shown. After all longerons are firmly in place, the process of carefully curving the spruce battens must be undertaken, tacking the ends to the longerons.

By all means do not attempt to cover a frame work of this type with sheet metal unless you have had a wide experience in beating out sheet metal into attractive shapes. It is best to follow the idea of putting on the spruce battens until you have the shape of the body fairly right, then padding with at least a half inch of felt which may be extracted from old automobile cushions, then putting on the fabrikoid covering.

After the fabrikoid covering is securely in place and drawn very tightly, tack only at the edges which will be around the bottom of the body and at such points as it is positively necessary to make separations in the fabric. Where the separations are made, be sure that you get the fabric in a perfectly smooth straight line so that it will be possible to match it, and so the seam can be covered with a strip of aluminum batting, which can be fastened in place with screws.

When the body is complete, careful coach work should be employed to cover in the edges surrounding the cockpit, and seat cushions should be put in place. The back cushion assembly should be hinged at its lower extremity, so that it may be tipped forward, giving access to the empty space in the rear of the body. Just how this upholstery is done depends upon the ingenuity of the builder and upon the materials which he has available.

It will probably be possible to obtain some good leather upholstery together with the springs and framework from an automobile parts depot at small cost. These can be cut down to fit the miniature sport roadster, but great care should be used to make sure that the edges of this upholstery when installed are finished off in such a manner as to take away the amateurish, home-made, appearance. A mahogany dashboard may be fitted to the miniature sport roadster containing such instruments as the builder may wish to install. The speedometer can be driven from one of the rear motorcycle wheels by using the conventional motorcycle speedometer cable and driving gear mechanism.

In order to complete the finished appearance of the little car, great care should be given to the mudguarding. Do not be content with merely taking old automobile mudguards or motorcycle guards and fastening them in place. Give some thought to your mudguarding, and if necessary go to the expense of having a first-class body man cut down some small car mudguards to fit your miniature job.

Pay special attention to the front splash pans which lead down to the front axle guards as shown in the front view of the tiny car. The front view of your car as it is being driven along the road will create the first impression,

## Custom-Build This M M Roadster

and if you want it to look like a modern, up-to-the-minute job, pay special attention to the mudguarding, and the shaping of the splash [illegible].

No running boards will be necessary on so low a car, and hence it may be advisable to carry an "under" splash pan from one side of the car to the other, underneath. This will improve the appearance, and protect the driving mechanism from mud and grit. The small car shown in the photograph did not have a splash pan underneath, although it is intended to fit one later.

In putting together a serviceable small collapsible top for your roadster, examine carefully the design and construction of some of the larger sport roadster tops. Or better still, if you have an opportunity to look at one of the small collapsible tops such as is supplied with one of the American Austin roadsters, look it over, and design your own top accordingly.

It is best to select a good grade of top covering material of a light tan or khaki finish, which will be waterproof, because a black top on a sport roadster does not go well, and accordingly, we advise that you steer clear of the black fabrikoid material for your sport roadster top, and stick to the duck or light canvas material. The top may be made collapsible to fit on the back of the turtle back, or better still, the frame work of it may be constructed from bent ⅜" rod, in sections, so that the entire top may be quickly dismantled and put out of sight inside the turtle back of your car when not needed. Side curtains may be designed and by purchasing the necessary top fittings, such as clips, lift-the-dot fasteners, etc., from an automobile supply house.

## Fate of Universe Studied by Science

*(Continued from page 53)*

The conductivity of the nitrogen gas increases with radiation from the cosmic rays, allowing more electricity to pass to the recording instruments. But, if the rays come from one direction, and one sphere is pointed there, it will cut off a portion of the rays reaching the other sphere behind it, and the difference can be measured.

In other words he has a telescope which measures not what reaches it, as the optical telescope does, but what does not reach it.

But, getting back to the argument over the origin of the cosmic radiation, where does it come from? The Abbe Lemaitre, at the last meeting of the British Association for the Advancement of Science, advanced the theory that the rays were the odds and ends left over where star atmospheres were born, tens of millions of years ago.

The stars, he explained, must have been born without atmosphere, and, when the cosmic rays escaped through the star crust, the atmosphere was created. "Cosmic rays," he explained, "would be glimpses of the primeval fireworks of the formation of a star from an atom, coming to us after their long journey through space." That would fix the source as those stars so far

*(Continued on page 176)*


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| 31x6 25-21" | 3.10 | 1.25 |
| 28x5 50-18" | 3.20 | [illegible] |
| 29x5 50-19" | 3.20 | [illegible] |
| 31x6 00-18" | 3.20 | 1.30 |
| 31x6 00-19" | 3.20 | 1.30 |
| 32x6 00-20" | 3.20 | 1.75 |
| 33x6 00-21" | 3.20 | [illegible] |
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## Flying Tanks Shed Their Wings

*(Continued from page 170)*

passengers for the return flight. Minneapolis air traffic being insufficient to justify the expense of a special speed road we proceed along the ordinary highways and city streets to the loop district and pull up inside the central depot to leave our car exactly three hours from the time we entered it in the Chicago central depot.

A flight of fancy? Perhaps. But not beyond the bounds of possibility. Until such time as planes are capable of arrested flight or are so dependable that they may be operated from the heart of a great city without undue risk to either passengers or inhabitants, this may well prove to be the most satisfactory solution of the airport problem. It is true that the necessity of taking passengers to the field has not been eliminated but the inconvenience element has been totally done away with and furthermore, in the case of large cities where the volume and radius of travel warrants the expense, high speed airport roads will permit the cars being shuttled back and forth at speeds quite impossible under present conditions.

A modification of the detachable car unit described in this article would lend itself admirably to freight purposes. In this case the freight cabin or car need not be equipped with motor or ground wheels but could be detached directly onto skeleton trucks or trailers for distribution at the terminal airports.

Still another application of the idea would be of inestimable value to sport planes. Arrived at a field the owner-pilot could detach and park the airplane unit and proceed in what would then become a lightweight closed car to his city destination. The car in this instance would in all probability resemble the little three-wheeled "tear-drop" car illustrated in the April issue of Modern Mechanics and Inventions.

## Movies of Sunburned Animalcules

MOTION pictures showing how tiny animalcules in a drop of pond water are first blistered and then killed by ultra-violet rays, much as too much sunburn by these rays blisters and kills cells in human skin, were shown by Dr. H. C. Rentschler, of Bloomfield, New Jersey, in a recent review of scientific progress during 1931 before the New York Electrical Society in New York City.

The kind of animalcules selected for the experiment were those called paramecia or "slipper animalcules," the last because of their resemblance in shape, when seen under a microscope, to that of a miniature slipper. Although each of these creatures consists of a single living cell instead of the billions of cells in a human body, the tiny animalcule seems to be covered by a kind of skin or membrane.

Some of these animalcules were placed under the lenses of a powerful microscope attached to a motion picture camera. Arrangements then were made to let ultra-violet rays fall on the animalcules while their movements were being photographed. A few moments after such exposure to the rays, Dr. Rentschler's motion pictures showed, small blisters appeared on the surfaces of the ray-burned animalcules.

## Fate of Universe Studied by Science

*(Continued from page 175)*

distant that rays leaving them millions of years ago are only just now arriving.

Millikan agrees in part, at least, that the rays are the product of new matter in creation. Sir James Jeans, the well-known British astronomer, takes the other extreme, and suggests they are the death rattle of matter committing suicide. Add to those two the view of the Abbe Lemaitre and other followers of Einstein, that the rays are the ghosts out of the remote past, and you can have your choice.

Millikan's evidence that the rays are really very short waves, like waves of light, or like the gamma rays of radium, and not fast electrons, like the beta rays, as Professors Bothe and Kolhorster believe, seems to have the best of the argument.

For, if the German scientists are correct, then the electrons, when entering the earth's atmosphere, should spiral closely around the earth's lines of magnetic force, with the result that they would fall more abundantly near the poles than at other places. But tests so far made on Hudson Bay and near the south magnetic pole show that is not true.

On the other hand Kolhorster's claim that the rays originated from one portion of the sky may be easily explained if the rays are, as Millikan asserts, waves of short length. For it would naturally follow that more would arrive from directly overhead than from points near the horizon, just as the sun apparently is brighter at noon at the zenith than at dawn or dusk, when its rays must penetrate a far greater layer of earth's atmosphere to reach the observer.

One clue was offered recently when Prof. Bothe and Dr. H. Becker produced cosmic rays experimentally at the University of Giessen by bombarding beryllium metal with the alpha particles from polonium, a radio-active element.

Linking that experiment with known facts about matter and the views of Millikan and Compton are considerably strengthened. The 92 elements of the known world have been arranged for convenience in an atomic table, starting with the lightest of all, hydrogen, which was numbered one.

Helium was given the number four, indicating that four hydrogen atoms should make one helium atom. But as a matter of fact it takes only 3.97 hydrogen atoms to make a helium atom, and the mystery of the other three one-hundredths of an atom has been a disturbing mystery ever since the table was compiled. Throughout its length there are other similar mysteries.

Einstein says to look for energy, that the missing portion was used up as power during the change. The .03 of an atom should be converted into radiation, much of it of a penetrating power equivalent to cosmic rays, and that, says Millikan and Compton, is undoubtedly how cosmic rays are born.

Out in space, Millikan believes, electrons and protons are floating about seeking to find mates. When these two separate bodies meet, after their long search through space, they combine and form the more simple atoms, such as hydrogen and helium. The collision, however, compels the electrons to give over some of their energy, which

## Fate of Universe Studied by Science

is liberated into space in the form of cosmic rays.

This mass production of atoms in space is followed by the formation of molecules of gas which in time collect into huge gaseous masses. From energy acquired from the outside, this gaseous swirl begins to oscillate at great speeds, giving rise to extremely high temperatures. Thus the vaporous agglomeration becomes incandescent, condenses and forms a series of suns.

In time planets are born of this sun by a process upon which scientists are still in dispute. The entire cycle, from the consolidation of the atom to the creation of suns and planets, however, goes on for ever. Thus the universe is promised immortal life.

Opposing theories of Eddington and Jeans dispute this view of Millikan and Compton, holding that the universe is running down, and that it is doomed to ultimate extinction. The stars, particularly our sun, are slowly dissipating themselves in the form of light and heat. This attrition cannot go on forever, and hence in remote ages to come the sun and stars will grow cold and eventually shrink into nothingness.

Millikan applies the second law of thermodynamics to the universe, which states that energy in the form of light and heat runs down hill. This light has its starting point in the hot interior of the stars. In the sun, scientists estimate, the temperature runs up to 41,000,000 degrees Centigrade. Amidst this intense heat molecules are rushing to and fro at tremendous speeds, colliding with great violence and breaking up into electrons and protons. Out of these violent smash-ups vast amounts of energy are being liberated in the form of cosmic rays.

As the heat from the sun passes through the substance of the sun, considerable heat is lost, until the radiation arrives at the sun's surface, where it is greatly diffused, but somewhat reduced in energy, being of the order of 6,000 degrees Absolute.

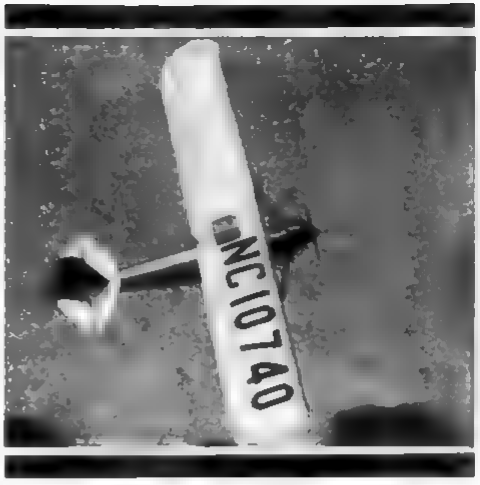
Further dissipation of the energy of radiation occurs when the cosmic rays traverse space, warming it slightly, but not enough to sustain life. With matter constantly being annihilated in the sun's boiling interior, the mass of the sun also decreases, losing, scientists estimate, approximately 360 billion tons per day.

Jeans believes that this light energy which has its inception in the sun's interior is constantly being dissipated, passing from a higher to a lower form, that is, degenerating from intense concentrated light, to diffused heat, so that the universe will eventually come to an end in a mild "heat death."

As an illustration in point, consider the case of the formation of coal. Light energy, such of it as is left after its passage through space, creates coal on the earth, absorbing comparatively small heat, together with a large quantity of light. In the burning process, however, small light with a comparatively greater quantity of heat is given off, so that the process, illustrative of the entire cycle of energy transformation, passes from higher to lower form, ending in the wide diffusion of heat and ultimate dissipation of light.

The two views can only be put to the test by

*(Continued on page 192)*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## More Sail for "Dorothy"

*(Continued from page 156)*

wood available, nicely rounded and tapered to the diameters shown at the different points. Small blocks, called dutchmen, are screwed on where shown to prevent ropes from slipping down. A three eye galvanized mast band 2½" inside diameter is fitted tightly on masthead, against a shoulder to prevent its sliding down. A wood collar is put around mast near roof for the boom jaws to rest on.

Now for the standing rigging, which is of galvanized steel wire rope. Quarter inch diameter is plenty strong enough for this. I'd pay a few cents more for 5/16" simply because it does not stretch so much. But suit yourself. The forestay has an eye spliced in the top to go over mast. The after eye of the band prevents it from slipping down. Both forestay and the shrouds, as side stays are called, have ⅜" turnbuckles to tighten them with.

Easy on those buckles, boys! Keep 'em tight, but no strong-arm methods—don't try to pull the mast through the bottom of the boat. And get even tension, so mast will not be bent forward or to one side. The turnbuckles attach to fittings called chain plates, of galvanized iron, carried in stock by all marine supply houses, put on by long galvanized screws through plank into frames.

The sails are to be made of what is known as six ounce sail duck, and my advice is to have a regular sailmaker do this job, because a good sail is not just a flat spread of cloth. It takes skill and knowledge to make it so that what is called the draft—similar to the curvature of an airplane wing—will come in just the right place. And if it's not right, the efficiency may be 50% off. But for Pete's sake don't write and ask me what your local sailmaker will charge. Ask him! Very little in these days of cheap cotton, I guess.

The mainsail has eyelets or grommets at about 1 ft. intervals along top and bottom edges, by which it is laced to boom and gaff with ¼" cotton rope. Other grommets are provided along the luff, as the edge next to mast is called, to fasten to 4½" diameter galvanized iron rings that permit it to slide up and down the mast. The jib is similarly fastened to small rings sliding on the forestay; or it may be provided with jib snap hooks, so it can be easily removed and stowed below.

Now for the last detail, the running rigging, as sailors call all the ropes used to hoist and control sails. Use ⅜" diameter manila for this. Bronze yacht blocks look very nice, but cost plenty. Ordinary galvanized iron awning pulleys, 2½" size, cheaply obtained at any hardware store, will do as well. The commonest mistake landlubbers make is to think the marine term "sheet" means a sail, but in fact it always means the rope which is attached to the clew, or the free corner of any sail, by which the sail is held in to the proper angle with the wind.

Two cleats, not shown, must be bolted to after deck, one each side, to belay the end of main sheet to. The jib has to have a double sheet, each part running through a block on the roof, 1 ft. back of mast and 15" out from center line, and thence to a cleat at after end of roof. Of course

only one sheet is used at a time; when you change course to bring the wind on the other side, the sheet is slacked away and the one on the other side tightened up as may be necessary.

The ropes that hoist the sails are called halyards. These can be made fast to cleats screwed on the roof at the foot of mast, but perhaps it is better to provide leader blocks on deck and run halyards through these and back to more cleats at after end—then sails can be hoisted or lowered from cockpit. The main halyard nearest the mast is the throat halyard, the other is called the peak. In hoisting, pull on both together, but tighten and make fast the throat first. Then pull up the peak halyard just enough to cause a slight trace of wrinkle near the throat of the sail. Remember rope stretches a lot, so tighten up halyards if necessary during the course of a long sail.

The rope running from boom to masthead, called the topping lift, is very important. This is slacked off while sailing so as not to chafe the sail, but always remember to tighten it up and make fast before lowering sail, or the boom will crack down on somebody's head, or maybe go overboard.

All of the hardware and fittings mentioned in this article can be secured from E. J. Willis Co., 85 Chambers St., New York, or from other marine hardware dealers in the principal seacoast cities.

Now, just one more bit of advice. Some have asked if a centerboard could be put in this boat to improve her windward sailing ability. No. The keel is far too light to have any slot cut in it. Change of this factor would involve complete redesigning of the bottom of boat, and frame construction.

If you are not satisfied with her as is, try bolting on a false keel to the bottom of real keel, making this three inches deeper all the way from station 3 to station 7, and tapering off at both ends. This was done on old Roamer with good results. But don't expect Dorothy by any means or device can be made to sail as close to the wind as a boat designed specially and expressly for finest sail performance—which, for that very reason, would be a poor motor boat. This is just a good all-around combination power and sail outfit. Which gives the most fun and satisfaction per dollar, per day or per mile, I think.

Blueprints for "Dorothy," showing both the sail plan presented herewith and the lug sail which appeared with the original article, are available from the blueprint department of Modern Mechanics and Inventions, 529 S. Seventh Street, Minneapolis, Minn., for $2.50. These blueprints are made from the original drawings showing all details of construction and are done up in large size for shop use, making it easy to scale off dimensions.

Builders who have already purchased a set of "Dorothy" plans may have a print of this larger sail plan without further cost if they will write in a request to the Blueprint Department.

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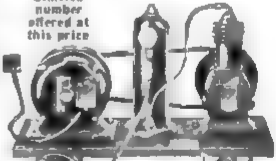

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## Gadgets for the Swimming Hole

*(Continued from page 101)*

are nailed up the side of the tall pole to permit the swimmer to climb to its top, grasp the handle of the slider, and cast off.

An ordinary rope pulley can be used for the trolley, from which is suspended, by a U-shaped piece of strap iron, an iron rod of approximately half-inch diameter and some 30 inches long, with supporting eyes at either end—the lower one being for the admission of a piece of broomstick to serve as a handle. The drawing shows a diver hanging onto the trolley with the hands, but if the rod is made to the 30-inch length recommended, it is even more fun to straddle the seat and ride into the water sitting down.

You can easily vary the angle at which the wire runs in relation to the water. Twenty-five degrees will give you a good, swift ride, and there is no danger of striking the post at the lower end of this thriller since the water acts as a brake.

Swing Splash is a simpler device which is lots of fun. It is, fundamentally, a swing built over the water and depends from a convenient, large, as-nearly-vertical-as-possible limb. This swing is different in that its length can be varied at will. The user gets in, standing on the board in the usual "pumping" position. He pulls down on the small rope and holds it while he gets up speed. At the top of a long arc, he lets out the small rope which lowers the bottom of the swing a few inches and when he hits the water most of it goes into the air.

The drawing shows how this is made. Use 5-ply wood, or build the mechanism from heavy angle iron. The swing board should be only an inch or two above water when raised and it needs only 4 or 5 inches of drop to do plenty of splashing.

Sometimes a suitable place for diving is of such small area that a proper length spring board is out of the question. The bouncing spring board is an ideal solution. Here we have a spring board of abbreviated length hinged at the back to the edge of a plank whose ends are well anchored beneath the ground. Support each side of the outer end of the board anchor with the ends of 4-inch strips of live rubber cut from old inner tubes. This method increases the up-and-down movement of the free end many times—in fact when it has been properly installed, this bouncing spring board will surpass a long plank.

It will take a little experimenting to find out just how much rubber will be needed. To fasten the ends of the rubber, lap them over the horizontal side 2-by-4 inch pieces and tie each with cord or wire. These side supports must be braced too, so that they will not swing in toward the diving board when it is in use. An up-and-down end movement of the board of 3 or 4 feet is not uncommon.


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## Cash for Answers to Brain-Ticklers

*(Continued from page 79)*

this be true when we know that the portion of a fluid which has the greatest density always goes to the bottom? The fallacy of the machine is that it does not consider the increase in atmospheric pressure in the shaft which more than counteracts the increase of pressure inside the tank from expansion. When the valve is opened in the shaft, air rushes in from atmospheric pressure.

Physics books tell us that the temperature rises 1° F. for every sixty feet we descend into a mine shaft. For the temperature to increase from 32° F. to 100° F. would require a shaft 4080 feet deep. Assuming an atmospheric pressure of 76 cm. of mercury at the surface the atmospheric pressure at 4080 feet below the surface would be surface pressure plus the weight of a column of air 4080 feet long. Taking into consideration the varying density of the column of air and changing to correct units we find that the pressure at the bottom of the shaft is over 93 cm. of mercury.[1] The pressure inside the tanks caused by expansion of heated air is only 86.58 cm. of mercury. When the valve was opened at the bottom air would rush in and make the ascending tank heavier than the descending tank. The machine could thus never run.

$$P = \frac{A + \frac{D_0 h}{2}}{1 - \left| \frac{h}{2k\left(t_0 + \frac{h}{c}\right)} \right|}$$

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The judges would like to run more of the excellent letters received, but lack of space forbids. Among the answers which were especially well thought out were those of E. L. Nugent, W. L. Faurot, Alex A. Root (who was among the few to point out that condensation of moisture from the air inside the tanks would soon make the machine inoperative), G. R. Spencer, Earl Marcoux, Frederick J. Pease, Ed. M. Goldsmith, J. A. Kenney, Leonard Jacobson, John McKnight, V. A. Cerruti, W. H. Harris, J. Milburn, Paul R. Rannie, Harry H. Hummel, G. Richey, H. F. Graham, Jim L. Dooley, Paul C. Heijn, and R. Vicente Rodriguez.

If you didn't win a prize this time, try your hand on the elevator brain-tickler. The field's open to everyone!

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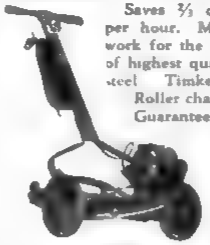

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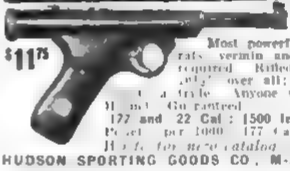

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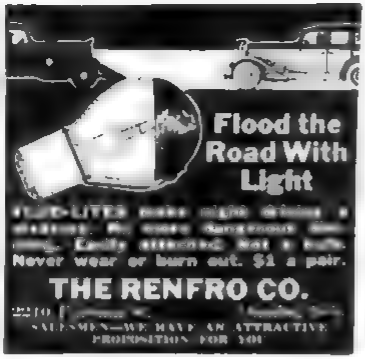
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## Fortune Making Ideas for Inventors

*(Continued from page 91)*

can be easily removed by the housewife herself. Nowadays the jar is first passed around to all the strong men in the house and then, these failing, the soaking process is resorted to.

Specifications: The jar should be based on a new principle and should not rely upon the screw top. The method of sealing should also be automatic and should become effective immediately the top is placed upon the jar.

Exploitation: Should be patented in all countries of the world where the home preservation of fruit and vegetables is carried on. This invention, on a royalty basis, should be worth at least a million dollars to the lucky fellow who has ingenuity enough to fill the need.

### *3. Silencer for Airplanes*

The automobile has been silenced to a degree undreamed of by the early automobile engineers, but the airplane is still an offender of the first order. All attempts to silence it have resulted in naught.

Yet, in a sense, the whole future of the industry depends upon this, for it is certain that the airplane will never be able to increase in use to a great extent until the din it produces is reduced.

A muffler for an airplane, one that will produce no back pressure and yet silence the exhausts from the engine, will be worth—well, it would be worth more money than I dare tell. The problem, however, is a tough one—I am free to acknowledge that. It will require a great deal of ingenuity, and what form it will take I cannot say.

Specifications: This muffler or system of noise reduction cannot be of great weight, yet it must effectively cut off all but a slight hum or whistle of the engine. It should not cost a great deal, although this is not very important if it does the trick and if the price is at all reasonable.

Exploitation: Should be licensed to all manufacturers of airplanes and should be patented in all of the large countries of the world.

### *4. Rattle- and Stick-proof Windows*

You fellows who do carpentry work should be able to solve this problem. Although the human race has for centuries been building houses with glass windows, we still have to find the window that will not rattle and that will not stick due to settling of the house.

What we need is a sort of "floating" window that will work easily and yet will not permit cold to enter. On the face of it, this problem sounds so easy of solution that I feel almost like going at it myself. It should be custard pie for a good mechanic.

Specifications: Window should be perfectly sealed—indeed it should be sealed more perfectly than are the windows in use at the present time. It should be absolutely free from sticking and no expensive material should be used in the construction.

Exploitation: Should be patented in all the countries of the world. This window should be licensed for manufacture.

### *5. Dish Washing Machine*

We have yet to find a solution to the problem of washing dishes on a practical and economical

basis. Perhaps something can be developed that will wash one dish at a time. That is, the housewife places a dirty dish in at one end so that it emerges from the opposite end cleaned and dried.

This is not an impossible idea for we have means of producing suds in profusion and we may also arrange a series of rotating brushes that will effectively clean and rinse. Then we may also direct hot air against the cleaned dish so that it will emerge practically dry.

Specifications: Price is the big item. I should say, offhand, that the dish washer that will eventually win over the American public will cost about one fourth of the cost of those that are on the market today. Not only that, but it will occupy one half of the space and will never break dishes.

Exploitation: Outright sale to a large manufacturer of electrical goods. Should bring the lucky inventor at least $100,000 in cold cash.

### *6. Short Grass Needs No Cutting*

Now that the patent office has finally decided to permit the protection of new plants, trees, etc., the time is ripe for some fellow to give us a stunted species of grass that will grow up to a length of one inch and then stop.

You fellows who live on farms will readily understand the significance of the suggestion and one of you will, no doubt, someday give suffering husbands such a grass seed. With such a seed available, I would be only too glad to tear up the present lawn and put down the new one. After that I should waltz out to the woodshed, get the axe and batter my lawn-mower into pieces so small that they would drop through a sieve. What are you going to do about it, fellow sufferers?

Specifications: The grass should be hardy but should not grow over an inch, or at most, an inch and half high.

Exploitation: Patent rights should be sold with a huge down payment against royalty, which should run a few cents a pound.

### *7. Radio Tube Detector*

It has been some time since I have mentioned a problem for radio fans and yet radio, regardless of the opinion held by many, is more in need of improvement today than ever before.

What is needed and needed badly is a simple device in connection with each tube socket that will tell when the tube in that socket is not performing as it should, due to defects in the tube. How is it going to be done?

Offhand I should say that the trick will be accomplished by some sort of a simple indicating instrument, electrical in nature, that will inform the non-technical users of radio equipment when a tube has "gone west". This would save repair bills in that it would permit many people to service their own sets.

Exploitation: Should be patented in all of the large countries and it should be sold outright to radio tube manufacturers in each of the countries in which it is patented.

Specifications: Should be inexpensive and should not cost more than a few cents per socket, so that the total addition to the cost of producing a radio receiver will not be raised over a dollar.


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## How to Build "Bouncer," a Catboat

*(Continued from page 126)*

Nos. 6 and 7 which come in 1" and 1⅝" to fine in to 2" at transom. This come-in agrees with the sheer so that the side planks will lie flat on the ribs when wrapped. With these data the frames can be drawn three inches to the foot and the rib lengths and angles scaled off the drawing direct for cutting. Will be within ⅛" of correct.

Cutting the floor transoms at the various angles taken off, the ribs are nailed to them with 2" gal. iron boat nails and the bottom and side ribs secured together by a single nail, clinched. Each frame, when finished and checked for measurements, is braced by two diagonal battens and has a batten across the top so they will keep their form. They are then set up at their stations and spiked to the keel.

Nos. 3 and 4 require the centerboard trunk finished first. The logs of 2"x6" oak are laid against the posts and scribed to fit the rocker, then sawed and planed. They and the upper boards are then nailed on, canvas strips soaked in white lead being pasted up the posts underneath. Two pockets for rib-ends are cut for Nos. 3 and 4 in the logs—most necessary because nothing else will hold them down or prevent them pulling free of the keel. A nail is driven in from underneath there to hold them. Bored for first, of course.

All this work, **all** boat work, must be bored before driving nails or there will be disastrous splits. I find a 3/32" twist machine drill in a small breast-drill is about right in oak for 2" boat nails.

The ¾" hole for gal. iron centerboard pin-bolt should also be put through at this time, before No. 3 frame goes in. To secure the half-floor timbers to the centerboard log, I prefer an oak cleat spiked to the timber and two stout screws securing the cleat to the log. Toe-nails will surely pull out, besides displacing the work in driving.

### Alignment Must Be Checked

With all frames set up, the first checks can be made. For sheer, stretch a string from stem knee to center of stern transom and check each cross-batten of the frames with the sheer column in the station table. For bottom ribs check, tack the two ⅞"x2" pine clamps temporarily along the bottom ribs about half way out. Any ups and downs will show up at a glance. The final check is got by the two stringers. Notching each side rib riser ⅞"x1⅛" (as the stock actually measures) wrap them in place and note results.

If they do not lie fair in the notches either the riser height is incorrect or the angle of the floor timber is wrongly taken off the drawing. We had very good luck, only two frames needed fixing. One had to be taken apart and its floor timber resawed, due to a mistake of an inch in one angle dimension. We were warned of it already by the clamps, it being low, and the sheer stringer proved it. Such frames as 1 and 6 are easy to get wrong as the top of the rabbet (base-rabbet column), not the keel-base measurement, gives you its bottom.

Once faired, the boat's frame is taking shape. The chines go on next. These are 1¼"x2½" and must be oak, so as to be tough enough to stand hitting rocks and also to hold the nails at the bent plank-ends where their pull-out stress is very

## How to Build "Bouncer," a Catboat

severe. As the side planks are ⅞" it is obvious that the side ribs and ends of the bottom ribs both must be notched ⅜" to bring the chine in flush. This done, the chines are sprung in, nailed to the rabbet of stem knee with ⅜" notch cut in it, and nailed to stern transom with the same ⅜" depth of notch cut there. They extend below the bottom ribs just ⅞" to meet the plank edges, the rest being bevelled off after the boat is planked.

The inter-ribs can now be cut and fitted. After they are in, the clamps are sprung in and nailed, the cross-thwart cut and fitted where notching on the centerboard trunk, and secured at the side ribs on a pair of cleats of its own. Then come the deck beams, mostly of ⅞"x4" y. p. crowned to match the stern transom, the side deck-stringers, the half-beams of 2"x⅞" y. p., and the cockpit coaming of ⅞"x5" y. p.

She is still not ready to release from the keel cleats and turn over. What is wanted is strength, so she will not warp and twist in handling. The side planks (of cypress in our case though usually white pine), are next wrapped around with screw clamps, scribed, cut to fit along their chine edge, and nailed on. Then the deck planking. We used second grade cypress of eight inch widths and began by notching the first pair of planks about four inches around the cockpit coaming on each side.

The two masts steps were then put in with four lag-screws each, and then the mast partners, of 4"x⅞" y. p. Under them reinforcements of the same wood clinched fast and 3" mast holes cut. The rest of the deck was simple lengthwise planking scribed and sawn around the plank sheer. To check up for twisting, sight across the cockpit coaming. Its four corners should lie all in the same straight line. There was a slight twist due to spring of the deck planks, but it came out on handling the boat.

The frame is now ready to pull the cleats holding it to the base plank and turn over. The first job, then, is to secure the keel to the centerboard logs. It will be found that it has sprung up a trifle. It needs a dozen 2½" No. 16 brass screws driven in, six on a side, through the keel bottom and into the centerboard logs. These screws are countersunk to bring them flush and drawn in tight. The joint is then caulked between logs and keel. Inset planks are then cut and fitted all along the keel between the after ribs and bevelled to match the ribs where they give a caulking lip extending half an inch over the keel.

### Planking Materials

We are now ready for planking. In Florida it is clear cypress, up north usually white pine. The garboards are eight-inch stock and are first clamped on and bent to fit as far as they will go, then scribed all along the rabbet and the amount ripped off. It is well to feel your way at the bow end, as planks do queer things when bent in. We took offsets off the stem rabbet and cut larger than that to have something to plane off as the screw clamps bent the garboard in, and we got an exact fit that way.

### How to Soften Planks

It all has to be steamed at the bow end. Cypress is brittle and will not stand any brutal bending,

*(Continued on page 186)*

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# How to Build "Bouncer," a Catboat

*(Continued from page 185)*

but it reacts astonishingly to steam. We put on wash-cloths at the bow end to hold the boiling water, then poured from an ordinary tea kettle. The moment it hit the plank the wood began to "give" and the screw clamps bent in easily. When they turned stiffly it was a warning that another kettle was needed.

The next two planks above the garboard have such sharp bends that no eight-inch plank will do it and make the twist at the same time. We tried it, broke the plank off short, then used two fours. After they were on, the work had progressed so that no screw clamps could get a pulling hold over the stem anywhere, so the rest were fitted at bow end while held up straight in position, then nailed fast, the steam applied, and then the after end bent down on the ribs. When clamped fast they came some distance off from the next planks but drove up snug by wedges and cleats secured temporarily to the ribs.

All this bottom work is in straight fore-and-aft full-width planks. There is no dividing into equal number of spaces at each rib as in a round-bottom boat. The planks only need "spiling." It is a curious fact that two straight-edged planks laid side by side along a boat's bottom will **not** meet. Reason would insist that they must; practice shows they do not but gap apart and the ends in long V's instead. The reason for it is the twist in the planks throwing the edges apart at the ends.

They must therefore be "spiled," as the shipwrights have it, that is, enough taken off one plank to make the planks meet in a caulking fit when bent and twisted into shape on the ribs by the screw clamps. To find out how much spiling, the plank is clamped to the ribs tangent amidships to the plank already on, and the amount to be taken off is scribed by a pencil and gauge-block, the distance being the widest opening between the planks at one end or the other. This is run the whole length of the plank, and will be found to give a long sliver to be ripped off, about ¾" thick at its deepest part amidships where the plank is tangent.

This procedure got us along with the remaining bottom planks. The last one is a double-ended curve, found by crawling under the boat and scribing it with the plank bent in place temporarily. The chine must be first prepared for it by bevelling its inside edge so its lip will be square with the ribs. At the bow end this bevel slants back to fade into the flat top surface of the chine in a long run of about two feet. The pull-out lift of the bent planks is very strong there, and for that reason the chine must be oak, to hold the nails which are driven in every two inches here. We had to use screws as our chine was cypress. All the planks must be bevelled 1/16" to caulk nicely.

The outside of the chine is now bevelled with a plane to carry out fair the run of the bottom. Prime coat of paint, caulk, pay seams with white lead paste and scrape smooth, finish bottom with sandpaper. There is no plane smoothing to be done. The waterline is 6¾" above the keel.

To lay it out, the time-honored string method will do. A straightedge fourteen feet long is set on stakes across the stern transom cutting a

## How to Build "Bouncer," a Catboat

waterline just inside Sta. 7. The point at bow is found by measuring from a base line string down 6¾", a tack put in there, and the waterline string led out. Keeping it on the straight-edge as you move it, it is secured with tacks as it touches the bottom, and the resulting marks are faired to a smooth curve. We gave her copper bottom green, two coats, yacht white for the rest of the bottom, the sides, and transom.

### A Word About Decking

She can be turned over when thoroughly dry. The deck was finished in eight-ounce duck, 30" width, notched over the coaming about twelve inches and a wide strip filling in over king planks for'd and stern deck aft. The gunwales should be 1½" half-round oak, but we had to use hard pine rounded from square. Deck painted two coats of buff, coaming and gunwales varnished. For flooring two 4"x⅞" stringers were first nailed in along each side of centerboard to give her additional longitudinal strength. These finished at Frames 7 and 2, nearly a flat line as laid on the floor timbers. The rest was four gratings of 4" stock with an 8" for the curve, meeting on Frame 5. This finished the hull.

She was astonishingly cheap, lumber bill $19.36; paint, one qt. can copper bottom green, one yacht white, two buff, seven light blue-grey for inside finish and prime coats, one pint varnish, $12.50. Hardware 7 lbs. 2" boat nails, 4 lbs. gal. wire nails, 4⅜" gal. iron bolts, 8⅜" lag screws, one ¾"x6" gal. iron centerboard bolt. The board was spiked together of 12"x⅞" hard yellow pine and immediately began to warp. It will do, but we will have oak up north. The lumber bill would be about $50 anywhere in New England. Our prices for "country" white pine ten cts. a board foot, oak 20 cts., hard pine 12 cts., decking, 7 cts. Down here in Florida the cypress came 7 cts., oak 5, pine 7, decking 3.5 cts., hence the light lumber bill. Oak is almost impossible to get.

### Rig

The Fish class cat calls for a twenty-five foot mast 2¾" diameter, 1½" at the top, 22 ft. hoist, 12'6" foot, 23 ft. leach with 6" of roach, about 135 sq. ft. of canvas. We made ours of 6½ oz. yacht sail cloth, three battens, two reefs. There are three 18" spreaders, two pairs of lower shrouds ¼", hounds ten feet below top of mast, two upper shrouds of 3/32" wire rope.

The rudder has two tillers, a long one for single-handed sailing, a short one for handling with guests. I put in a step and reinforcement for a mast hole just forward of the coaming but covered it with the canvas to be cut out later. It will be interesting to try this model with a miniature **Bacchant** rig.

**BLUEPRINTS FOR "BOUNCER"**

**A set of large size shop blueprints for "Bouncer," made from the original drawings illustrating this article, is available for $1.00 from the Blueprint Department, Modern Mechanics and Inventions, 529 S. Seventh St., Minneapolis, Minn.**


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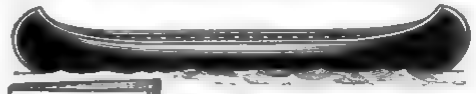

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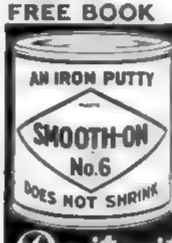


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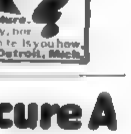

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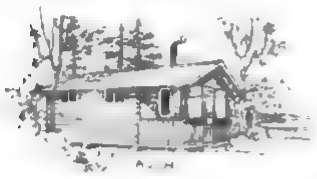
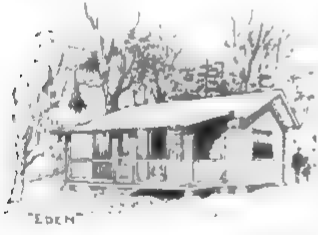


### "AVON"

"Avon" cottage is 12x20, including porch. Living room 12x14½ to accommodate two single beds. Estimated cost of materials, taking advantage of present day market prices, is $95. If you hire a carpenter to build "Avon," the cost should run around $240. Blueprints consist of a set of four, each 16x26 inches done to a scale of ½-inch to one foot. Primary aim of this series of plans is to obtain lowest cost with sound construction, using standard materials. Price of blueprints, including bill of material **$2.50**

### "CROSS"

Including the porch, "Cross" cottage is 16x20. The living-room is 12x16, arranged for two beds. Estimated cost of materials, $115, cost complete if you hire it built, $310. Plans of all cottages show use of insulating board if you want to use the cabin as a hunting lodge in fall or winter. Blueprints of "Cross" consist of a set of four, sent postpaid with complete specifications and bill of material for . . . . . **$2.50**



### "EDEN"

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There are four other cottage plans in this series, not shown above. "Bard" is 12x24, costs $110 for materials; "Dream" is 16x24, including porch, materials cost $125; "Forest" is 20x40, with fireplace, materials cost $400; "Nautilus" is a cabin that grows with additions, full size materials cost about $450. Address orders and inquiries to

MODERN MECHANICS AND INVENTIONS
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## Make Big Profits Raising Bullfrogs

*(Continued from page 119)*

The man who decides he may well earn a fortune with frogs should consider two things: His finances and his knowledge of frogs. First, he must expect to wait two years for the first harvest; second he must learn as much as he can about planting shrubbery around his ponds and handling the frogs.

Mr. Herriman declares that planting is as important as breeding. The simple steps of both I shall set forth in these following paragraphs.

First, in building his frog farm at Lakeside he brought in scoops and dug his own ponds. Then he erected a five-foot-high board fence around the mating pond, this to keep out dogs, snakes and coyotes. Meantime, he ordered from Louisiana 106 pairs of common bullfrogs.

Second, he procured from New Orleans the following plants: 125 water lilies, 6,000 arrowheads, 250 pickerel weed, 800 wild celery, 500 Iris, 1,000 cat-tails, 500 willows, 300 water lettuce, and 100 water hyacinth.

These plants serve four functions. They shade the edges of the ponds, supply food to the tadpoles and crayfish, attract insects which the frogs eat and supply oxygen below the surface of the water. There you have almost perfect self-perpetuation in the plant and animal kingdom!

The principal problem in frog raising comes in separating the larger from the smaller to prevent the cannibals from devouring their smaller brothers and their young.

No care is required for frogs in the wild state, but where there are many in a small area an artificial food supply must be provided. Surface minnows stocked in the same pond eat insect larvae and in turn are eaten by the frogs. And they have the decided advantage of costing nothing to perpetuate. Crayfish (crawfish) may be raised in all but the tadpole pond, for they eat the tadpoles. Small green frogs, less than two inches long, may be raised in the smaller ponds and fed to the bullfrogs at proper intervals. These little fellows eat small insects.

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*(Continued from page 152)*

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| 48.86 | 6.140 | W8XK—East Pittsburgh (relays KDKA) | |
| 49.0 | 6.122 | FRCD—Saigon (Fr. Indo China) | |
| 49.02 | 6.120 | W2XE—Long Island (Relays WABC) | |
| 49.18 | 6.100 | W3XAL—Bound Brook, N. J. (Relays WJZ). | |
| 49.23 | 6.094 | VE9GW—Bowmanville, Ont. | |
| 49.31 | 6.080 | W9XAA—Chicago (Relays WCFL) | |
| 49.34 | 6.076 | W2XCX—Kearny, N. J. (Relays WOR). | |
| 49.4 | 6.072 | ZTJ—Johannesburg, South Africa. | |
| 49.47 | 6.069 | VE9CS—Vancouver, B. C. | |
| 49.5 | 6.060 | W3XAU—Philadelphia (Relays WCAU) | |
| 49.5 | 6.060 | W8XAL—Mason, O. (Relays WLW) | |
| 49.5 | 6.060 | VQ7LO—Nairobi (Kenya Colony) | |
| 49.67 | 6.042 | W2XAL—Coytesville, N. J. (Relays WRNY) | |
| 49.7 | 6.038 | PK3AN—Serabaja (Java) | |
| 49.83 | 6.020 | W9XF—Chicago (Relays WENR) | |
| 50.0 | 6.000 | EAR15—Barcelona Radio Club | |
| 50.0 | 6.000 | RW59—Moscow (Russia) | |
| 50.0 | 6.000 | ZL3ZC—Christchurch (New Zealand) | |
| 51.22 | 5.857 | XDA—Chapultepec (Mexico) | |
| 50.26 | 5.970 | HVJ—Vatican City, Rome | |
| 51.52 | 5.502 | W2XBH—Brooklyn, N. Y. | |
| 62.5 | 4.800 | W2XAV—Long Island | |

## Make Fly Rods in Your Workshop

*(Continued from page 132)*

(top), work down the bamboo as for the ferrules and tips, and cement in place. After the cement is set, place a little more around the place of union and slip the taper ring in place. This should fit the bamboo hexagon snugly to give a finished effect to the butt assembly.

Winding the rod with silk is somewhat a matter of personal preference and somewhat a matter of striving for the action desired. Windings give the rod more stiffness or "backbone" and at the same time somewhat slow up the "action" of the rod. In some cases backbone is most desirable and in others, action, so the spacing of windings will depend on the likes of the rod user.

In any case it will be best to place windings at the points of union between ferrule and bamboo, tip and bamboo, and a narrow band tightly against the taper ring on the butt joint to help exclude moisture. The method of applying windings of the silk is shown in Fig. 7, the winding being done in the order as numbered.

Snake line guides should vary in size with the taper of the rod, the smaller ones being used on the tip and larger ones on the butt and middle joints. The number to use will depend on your rod. A rod with plenty of "backbone" will need two on the tip and two on the middle joint, while a whippy rod should have three to the joint.

Space the snake guides evenly throughout the length of the rod, as many as are needed, tying them in place with winding silk as shown in Figs. 4 and 6. The agate guide used on the butt joint is held in position in the same manner. This should be mounted about a third of the way down from the small end of the butt joint.

In making all windings use considerable care to conceal the ends of the silk, as shown in Fig. 7. Use a loop of the silk to draw the end under the winding, or trouble will be experienced due to windings coming loose. Also use care in lining up the guides throughout the length of the rod or proper use of the line in fly casting cannot be obtained.

Another accessory, shown in Fig. 7, is a small ring and ring keeper. This is to hold the hook when walking with the rod from pool to pool. It is mounted three or four inches above the taper ring by "winding" on with silk.

Proper finishing of the rod will do more to establish its value than any one other thing, as much of the action depends on the varnish used in finishing. Only regular rod varnish should be used since all shellac base varnishes are too brittle and crack too easily.

Before varnishing, clean the rod thoroughly, using gasoline to remove grease if necessary, and smoothing down rough places with fine emery cloth or steel wool. Give the windings a coat of winding silk preservative to prevent fading and rotting and to make a base for the varnish.

Let this dry a few hours. Finally, apply a coat of varnish with a soft camel's hair brush and allow it to dry at least 24 hours, then follow with another coat. If a particularly fine job is desired this coat may, after a few days, be rubbed with pumice stone and water, another coat applied and rubbed with pumice and polished with rotten stone rub.


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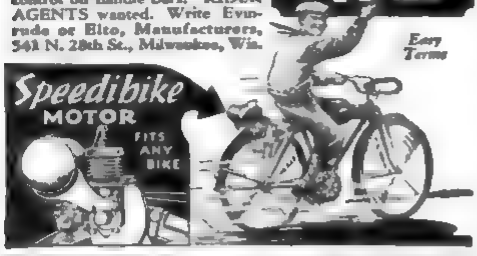


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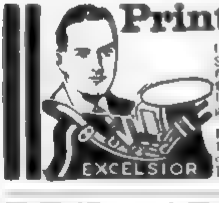


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## Thrills and Spills of 6-Day Bike Races

*(Continued from page 73)*

"It is a curious commentary on American manufacturing methods," he said, "that in this particular branch of industry all bike speed champs and aspirants turn to European makes for their metal chargers. The foreign bike manufacturers seem to have a monopoly on essential components for the ideal racing bicycle.

"The secret of the superiority of European-made bikes is embodied in the fact, I have found, that the foreign manufacturers use a steel tubing while in this country the makers use various metals, producing a wheel that is brittle and when breaking may cause serious injury to the rider.

"The foreign bike frames do not snap into jagged pieces when they are smashed in accidents, but they bend. This flexible quality of the steel used is what has made them popular, I have been informed by many of the champs.

"American-made bike tires, however, hold the supremacy. These are very important parts of the crack racing cycle. Worth Mitten, of Davenport, Iowa, a former six-day bike racer, has perfected the type of tire which is the most popular with these distance riders. They are a form of miniature auto tires, constructed along the same lines.

"They are made of cord with a rubber strip outside instead of the rubber casing, and they have an inner tube which can be injected or extracted immediately. In a serious jam the front tire is sure to blow, but in such an event the wheel is removed and another set in its place. This process requires exactly 20 seconds.

"The bike tires hold 125 pounds of air while an ordinary automobile tire contains about 35 pounds of air. This gives you an idea of the solidity required in the tire for the strenuous grind. Yet Mr. Mitten has developed a tire which meets with little resistance and fits neatly into the scheme of easy propulsion.

"Each six-day bike rider has two complete bicycles and four extra wheels. For a heavy man the wheels are built with extra spokes and most of the hard riders have to have reinforced wheels because of the weight they put on them in the turns. They ride what is called a 96-gear bike.

"The saddle is a matter of individual taste and comfort. No special features enter here. The feet are strapped to the clips so that rider and bike will keep together at all times, a point which is indispensable as the bicycles have not got brakes, of course. This is what makes the spills so disastrous. The rider cannot liberate himself from the crashing vehicle.

"Handlebars are also installed on bikes to suit the comfort and pose of the riders. An important factor is their narrowness, allowing the sprinter to shoot through holes in the field. I am told that here again the foreign product surpasses American-made handlebars."

Like every other field of human endeavor which has lasted for any length of time, bike racing has its unique tricks, ruses and strategies. I am not going into the obviously crude and malicious stunts and conspiracies which have been practically eliminated from the sport.

## Thrills and Spills of 6-Day Bike Races

Each team of two men has its own particular trainer. It is the latter's business to keep his eyes open for possible "breaks."

The trainer tries to observe the goings-on in the enemy camps, particularly in the one where the team is out in front. He is watching for the opportune moment when he might signal his team to snatch a lap.

If the partner of the man who is out in the lead happens to be under the showers, sprucing up for his next interval on the saucer, the observant trainer immediately gives his boys the word.

Lots of times riders catch the leader napping and will steal along the flat of the track to gain a lap. But usually they look for an angle on which to make the dash. They try to get up on the bank at the turns and then shoot off at an angle, counting on the momentum to spurt them into a surprise lead.

## Toboggan on Water This Summer

*(Continued from page 147)*

toboggan, so that the single rope leading from there to the towboat exerts an even pull.

To start your trip, use a dock or raft a foot or two above the water for a take-off platform. Two or three passengers get on, holding tightly to the hand ropes. The boat pilot is then signaled to start. A ten-foot slack should be left in the tow-line; when this is taken up you zip onto the water and start traveling.

Right here the suggestion is timely that signals be arranged with the boat driver to slow down or speed up as you prefer.

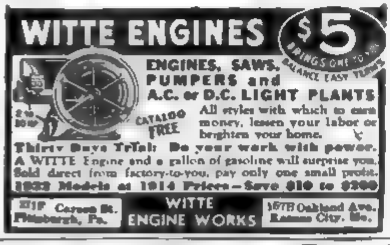
Coming back to the dock, the driver slows down a bit and runs parallel to it. The riders step off one at a time, starting from the rear. This sounds complicated, but is really quite simple.

Here are a few tips on stunting the water toboggan. The Super Skid is a blown-in-the-glass thriller, performed by sliding off to one side over the wake of the towing boat until you are in smooth water. Then the boat driver turns slowly the other way, accelerating the toboggan rapidly. The riders must keep banking with their bodies and pulling back on the ropes to hold the forward side of the toboggan off the water's surface so it will not catch. Although the tow boat may be doing only 20 miles an hour, the passengers on the board will have been riding 40 to 50.

This same Super Skid can be utilized in coming ashore, for the boat can not come in close. A little practice and cooperation from the driver of the boat will enable you to take off from the shore and skid back up without being wet by anything but spray.

For toboggan jumping, a platform eight by twelve is built of one-inch planks running lengthwise. This is set on an incline in the water, either placed on light piling or floated at one end by barrels and anchored in position, as shown in the drawings. It is important that the lower end of the platform be several inches under water.

The driver of the boat then runs as close to the platform, parallel to the sides, as he can. The tobogganists slide their board over until it is directly in line with the center of the platform—up they go, and away they sail to alight on the water much more gently than they anticipate.

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## Two Trail's End Bunk Houses

*(Continued from page 169)*

This snug little cabin will accommodate four people comfortably. By using cot beds in the living room, more guests can be put up for the night. Notice that the front half of the living room is really an enclosed sun porch. With the doors wide open you have a screened porch without having had to build one separately. The roof may be built to extend over the terrace, thus providing an enclosed porch. As the plan shows, there is adequate closet space—an essential feature for every cabin.

Plan No. 4-W-39, the other cabin illustrated with this article, is a type somewhat more appropriate for a mountain or hillside location. A feature of this plan is the fire-place with seats on both sides. The porch may be opened or closed. There are two bed rooms and a projecting bed room may be added later if you wish. Other details of the arrangement are shown in the plan.

Now what about the costs? That is difficult to estimate. As summer cabins should be inexpensively provided and if the owner is willing to do some of the "tinkering" himself, the construction costs should be reasonably nominal.

## Fate of Universe Studied by Science

*(Continued from page 177)*

measuring cosmic rays more accurately than has yet been done, and that is what the Compton expedition and its associated workers will attempt to do this summer.

If Millikan is proven right, then the birthplace of the rays is in outer space, and not in any particular locality, but in all outer space. While some of his views conflict with the Einstein theory, this one rests largely on Einstein's equation for the relation between energy and mass.

If the correct answer is found, the solution of another old problem, the nature of the northern lights, should come with it. In fact as far back as 1919 W. F. G. Swann suggested that the origin of the penetrating rays might be in the X-rays produced by the electrons from the sun, which Birkeland supposed responsible for the aurora.

Birkeland assigned to these rays a velocity only slightly less than that of light, which would give them energies of about one billion volts. That would be more voltage than would be required for the purpose, so that the softer rays, which would be too soft to correspond to the aurora except at very high altitudes, would be left over as cosmic rays.


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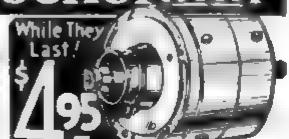

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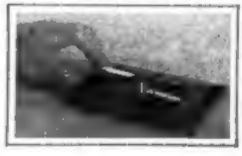

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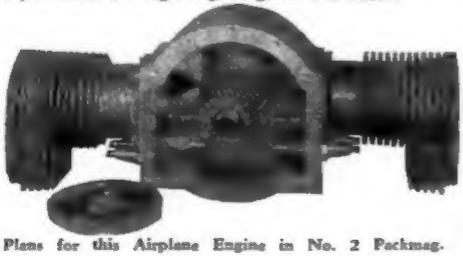

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**PYROIL COMPANY**
W. V. KIDDER, Pres.
672 PYROIL BLDG., LA CROSSE, WISC.

## Does What Oil Alone Cannot Do

A Pyroil-treated CHEVROLET recently ran 318.7 miles with *no oil in crankcase*—an ESSEX 206.8 miles—another 161 miles! PYROIL reduces wear, friction, noise. Speeds revolutions, keeps bearings cool, provides a *triple-film* of lubrication that keeps metal from metal, ends dangers, makes motor operation efficient, *safe.*

**Mr. W. V. Kidder, Pres.**
**PYROIL CO., 672 Pyroil Bldg.,**
**LaCrosse, Wisc.**

Send me at once the full facts of PYROIL, its accomplishments and many recommendations by leading industrial authorities. Also, complete Sales Plans and NO RISK OFFER.

Name_____

Address_____

City_____ County_____ State_____

Rough sawed miter joint made with METALLIC-X resists combined weight and muscular pull of 165-lb. man. Sworn statement on request.

# This Amazing Test PROVES The Incredible Strength of METALLIC-X!

THE illustration above only partly reveals the enormous strength of that amazing new discovery called METALLIC-X. Actually, the wood will break in such a test before the joint can be torn apart. But that's only half the story. Metallic-X will join anything with the same grip of steel! Joins wood to wood, metal or glass—metal to metal—glass to glass and scores of other combinations all bonded together as if one piece!

There are literally thousands of uses for this astounding discovery. In every home, almost daily, some article is torn, broken or comes apart that can be restored to usefulness with Metallic-X. The list is practically limitless—china, cooking utensils, toys, furniture, glassware, tools, shoes, knife handles, auto tops, auto-radiators, water and steam pipes, faucet handles, cracked wood-work—in short almost any article in any home can be mended with Metallic-X and often made stronger than new.

Besides, many industries are rapidly replacing glue and other adhesives with Metallic-X. It is already being used by furniture factories, builders of railway cars, railroads, the United States Government and many others. Welcomed as a godsend by cabinet makers, pattern makers, model builders, aircraft workers, carpenters and scores of others for new work as well as repairs.

Easier to use and worlds stronger than glue, cement or solder. Even replaces welding and riveting in some cases! No heat, acids, clamps, soldering irons or tools of any kind needed! Not affected by heat, water, oil, acids, or atmospheric conditions. Will not crack, soften or dry out—and wild horses cannot tear it apart.

Mail coupon today for full information and FREE SAMPLE demonstrating the incredible strength and many uses of this amazing discovery!

## MENDS ANYTHING

The illustrations on the right show only a few of the many uses for Metallic-X. There are hundreds of others! Wood, metal, glass, marble, tile, porcelain, brick, leather, bakelite, slate, bamboo and fabrics of every description—all can be mended with METALLIC-X stronger than new! A single tube often saves up to $50 and $75! Mail the coupon below for amazing sample that proves the truth of every statement in this ad.

## AGENTS—DISTRIBUTORS MAKE UP TO $50 IN A DAY!

Agents and distributors everywhere are simply coining money with METALLIC-X. Sells like greased lightning to stores, homes and manufacturers! Sensational "Magic Wand" demonstrator and revolutionary new merchandising plan bring in profits beyond your wildest flights of fancy—up to $50 in a day—$300 to $400 a week and over—no limit to possibilities! Automatic repeat business on practically every sale assures permanent, lifetime business. Exclusive territory for hustlers—territories going fast. Mail coupon at once for full description of Metallic-X and the extraordinary opportunity it offers YOU!

**LUX-VISEL, Inc.**
**Dept. K-5080 ELKHART, IND.**

**FREE SAMPLE**

Lux-Visel, Inc.—Metallic-X Division,
Dept. K-5080, Elkhart, Indiana.
Rush me full information about Metallic-X and wonderful opportunity it provides. Enclose FREE sample.

Name.....

Address.....

City.....State.....